Analysis of Key Factors Affecting Kaizen and Development of a Framework for its Effective Implementation in Automobile Sector of Pakistan

By

Muhammad Saleem

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Supervisor: Dr. Nawar Khan

Department of Engineering Management

College of Electrical & Mechanical Engineering (E&ME)

National University of Science and Technology (NUST) Islamabad

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Declaration

I certify that this research work titled "**Analysis of Key Factors Affecting Kaizen and Development of a Framework for its Effective Implementation in Automobile Sector of Pakistan***"* has been carried out by me and it's entirely my own research effort. The research presented in this thesis has not been submitted anywhere else for appraisal. Also, quotations and data taken from primary and secondary sources have been properly cited and acknowledged.

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Copyright Statement

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To,

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My Wife Dr. Nasreen Ijaz My Son Muhammad Omer Saleem, Muhammad Ibrahim Saleem

My daughter Amna Saleem

and

My best friend Qazi Khaleel Ahmad (late)

Table of Contents

List of Figures

List of Tables

List of Annexures

List of Abbreviations

ADI	Average Deviation Index
AGFI	Adjusted Goodness-of-Fit Index
ANOVA	Analysis of Variance
AO	Action Oriented
APMA	Association of Pakistan's Motorcycle Assemblers
AVE	Average Variance Extracted
CBU	Completely Built UP
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	comparative fit index
CI	Continuous improvement
CIP	Continuous Improvement Program
CKD	Completely Knock Down
CM	Cellular Manufacturing
CPI	Continuous Process Improvement
CR	Construct Reliability
CV	Criterion Variable
DV	Dependent Variables
ECK	Employees Commitment to Kaizen
EFA	Exploratory Factor Analysis
EKTT	Employee's Knowledge about Kaizen Tools & Techniques
FBR	Federal Board of Revenue
FGDs	Focus group discussions
GFI	goodness-of- fit index
HRD	Human Resource Development
IV	Independent Variables
JICA	Japan International Co-operation Agency
KETD	Kaizen Event and Team Design
LCV	Light Commercial Vehicle
OEM	Original Equipment Manufacturer

OIPI	Organization Internal Process Improvement
OKC	Organization Kaizen Culture
OLS	Ordinary Lease Square
OSK	Overall Success of Kaizen
PAAPAM	Pakistan Association of Automotive Parts & Accessories Manufacturers
PAMA	Pakistan Automotive Manufacturing Association
PCA	Principal Components Analysis
PEDB	Pakistan Engineering Development Board
PI	Personal Initiative
PKR	Pakistani Rupee
PIP	Project Implementation Profile
PQI	Product Quality Improvement
PV	Process Variables
RMSEA	Root-Mean-Square Error of Approximation
RR	Rewards and Recognition
SEM	Sequential Educational Modeling
SGA	Small Group Activity
SKD	Semi Knock Down
SMED	Single Minute Exchange of Die
SOIP	Standardized Organizational Internal Process
TBS	Tariff Base System
TCI	Team Climate for Innovation
TDAP	Trade Development Authority of Pakistan
TLI	Tucker-Lewis coefficient
TMC	Top Management Commitment
TOW	Training of Workers
TPM	Total Productive Maintenance
TQM	Total Quality Management
WAI	Work Area Improvement
WIT	Work Improvement Team
ZD	Zero Defect

Abstract

There are a number of philosophies, tools and techniques available for continuous improvement of performance of the organizations. Kaizen is one of the Japanese management philosophies, which can be effectively implemented for continuous improvement of performance, work area, product quality, organizational internal processes and development of human resource. Primarily, Kaizen was developed and implemented by automobile sector organizations of Japan. Most of the automobile organizations of Pakistan are Japan based and have tremendous contribution in economic development of the country. Therefore this sector was selected for measuring perceptions of respondents regarding different factors affecting Kaizen and its outcomes.

The theoretical framework for effective implementation of Kaizen was developed through identification of key factors from literature review and survey of automobile organizations and discussion with proponents of Kaizen in Pakistan. In this research, Top Management Commitment, Organization Kaizen Culture, Personal Initiative of Employees, Rewards & Recognition, Training of Workers and Kaizen Event & Team Design were selected as independent variables of Kaizen. Variables such as Human Resource Development, Work Area Improvement, Product Quality Improvement, Organization Internal Process Improvement and Overall Success of Kaizen in an organization were incorporated as outcome variables of Kaizen in theoretical framework.

In this research, survey technique was adopted for the collection of data for empirical analysis. The existing questionnaire found in the literature was amended, and this modified questionnaire consisting of two parts was used in this research. Construct validity and reliability of survey scale items were checked through Factor Analysis. Survey was conducted in two phases. In first phase, Part I of survey questionnaire was forwarded to 455 automobile sector organization including member organizations of Pakistan Automobile Manufacturing Association (PAMA), Pakistan Association of Automotive Parts & Accessories Manufacturers (PAPAM) and Association of Pakistan's Motorcycle Assembler (APMA). Out of those 455 organizations only 216 organizations responded back showing response rate of 47.5%. Kaizen tools and techniques implementation status was found good / satisfactory in 97 organizations. In second phase of survey, perception of individual respondents regarding statement of survey scale

items related to independent, process and dependent variables of Kaizen was measured from selected organizations of Phase-1 of the survey. A total of 200 respondents from 61 different organizations including respondents from top management, middle management and shop floor workers working as Kaizen team members and team leaders responded back to survey questionnaire. During face validation and data screening through descriptive statistics, 27 survey responses from 7 different organizations were rejected due to incompleteness or biasness.

Finally 173 survey responses from 54 organizations, implementing Kaizen tools and techniques for continuous improvement were empirically analyzed. The relationship among independent and dependent variables was determined through statistical analysis of data collected through measure of perceptions of the respondents. Pearson Correlation Test, ANOVA and Multiple Linear Regression Analysis were applied to confirm the proposed theoretical research framework. Results of statistical analysis indicate that critical factors such as Top Management Commitment, Organization Kaizen Culture, Personal Initiative, Reward & Recognition, Training of workers and Kaizen Event & Team Design have medium to strong positive correlation having Pearson Correlation Coefficient values ranging from 0.413 to 0.791 with outcome variables of Kaizen.

After confirmation of all pre-requisites of Multiple Linear Regression Analysis from the data, regression model for each outcome variable of Kaizen was developed. The results indicate that model developed for outcome variable Human Resource Development account for 76.7% variation in it due to change in independent variables such as Top Management Commitment, Organization Kaizen Culture, Rewards & Recognition and Training of Workers having standardized beta coefficient values 0.432, 0.206, 0.242 and 0.269 respectively. The regression model developed for Work Area Improvement account for 72% variation in outcome variable of Kaizen “Work Area Improvement” due to independent variables such as Organization Kaizen Culture, Rewards & Recognition and Training of Workers having beta coefficient values, 0.251, 0.315 and 0.549 respectively. Similarly the third regression model developed for Product Quality Improvement accounts for 72.3% variation in it, contributed by three independent variables such as Top Management Commitment, Organization Kaizen Culture, and Training of Workers having beta coefficient values, 0.428, 0.338 and 0.350 respectively. Fourth model accounts for 75.5% variations in Organizational Internal Process Improvement, contributed by five independent variables such as Organization Kaizen Culture, Rewards & Recognition, Training of

Workers, Personal Initiative of employees and Kaizen Event & Team Design having beta coefficient values, 0.220, 0.255, 0.221, 0.455 and 0.210 respectively. Finally, 69.2% variations in Overall Success of Kaizen were explained by four independent variables of Kaizen such as Top Management Commitment, Personal Initiative of employees, Rewards & Recognitions and Training of Workers having beta coefficient values, 0.281, 0.228, 0.219, and 0.361 respectively. The results of mediation analysis indicate that process factors of Kaizen partially mediate the relationship between independent variables and overall success of Kaizen in an organization. The results of this study are in line with the research carried out on Kaizen event effectiveness in the UK. The framework for effective implementation of Kaizen was developed by incorporating all independent variables (input factors) having medium to strong correlation with outcome factors and has significant contribution in regression model developed for different outcome variables of Kaizen.

This research study is limited to automobile sector organizations of Pakistan, however, in future the scope of this research can be widened to other sectors as well. Secondly, in this study the relationship among 15 different variables (independent, process and dependent variables) of Kaizen has been analyzed. The relationship among other organizational factors, internal as well as external affecting Kaizen may be identified through empirical analysis in future research work.

CHAPTER 1: INTRODUCTION

1.1 Introduction to Research

Customer's desires and perceptions are rapidly changing. In order to meet the rapidly changing desires and perceptions of the customers and to retain share in the global market, organizations have to remain competitive through effective use of CI tools and techniques (Al Smadi, 2009). Customer orientation and a strong sense of competition have brought the organizations on a cross road. The ever-tightening competition between the quality of the product and reduced profitability requires the organizations to pave the path of continuous improvement (CI) through system simplification using different quality tools and techniques (Bessant, Burnell, Harding, & Webb, 1993).

There are a number of philosophies, tools and techniques available for continuous improvement of performance of organizations. Kaizen is one of the Japanese management philosophies, which can be effectively implemented for CI of performance, work area, product quality and organization internal processes (Oliver, 2009). Effective implementation of Kaizen tools and techniques ensure improvement in performance of the organizations. Kaizen is one of the core strategies for advantage in performance and is very much essential in today's competitive environment (Worley, Doolen, Van Aken, & Farris, 2007). It is an endless drive of CI which involves everyone in the organization (Singh & Singh, 2009).

Kaizen is considered one of the important elements of Japanese manufacturers competitiveness (Imai, 1986a). Kaizen is a widely used and discussed management philosophy for CI of processes, quality of product, and performance in variety of organizations of the world (Singh & Singh, 2009). It ensures that manufacturing process becomes leaner and fitter and adds values by identifying and eliminating waste. Imai (1997) in his book "Gemba Kaizen" defines Kaizen as; "Kaizen means CI". The Kaizen philosophy assumes that our way of life in offices, social sectors or at homes must be the main focus of CI struggle (Imai, 1986b).

Kaizen is generally defined as "continuous improvement of standard way of work" (Chen, Dugger, & Hammer, 2001). Kaizen is a combination of two Japanese words, Kai means change and Zen means better, so Kaizen mean "change towards betterment" (Khan, 2007; Palmer, 2001). The word Kaizen comes from Gemba Kaizen which means CI at shop floor (Hammersmith, 1997). As per Terziovski and Sohal (2000) Kaizen means "continuous

improvement through involvement of all people of the organization". Bessant and Francis (1999), define Kaizen as sustained problem solving technique. Kaizen is a small innovation which is based on participation and empowerment of shop floor workers. Kaizen means going beyond the contracted role of work force and continually develop better ways of doing job to enhance organizational performance.

This type of concept involves the company learning from its mistakes, determining the root causes of problems, providing effective countermeasures and empowering people to implement those measures. It facilitates a sense of accomplishment among workers, creating a pride for their work and increasing satisfaction level. Kaizen is a process of transferring new knowledge to the right people as part of company's standard work procedures and to transform it to a learning organization. Kaizen demands perfection in processes, quality through philosophy of Just In Time (JIT), concept of Zero Defects (ZD), no waste and productivity enhancement with a continuous journey towards improvement (Imai, 1986b). Kaizen is "a mindset of each individual towards continuous improvements. Kaizen does not require too many specialists to implement; therefore, Kaizen is less expensive than other continuous improvement techniques" (Sing & Sing, 2009).

Kaizen refers to small incremental changes toward betterment which accumulate into larger effects on overall performance of the organization(Martin & Osterling, 2007). Kaizen is implemented through small incremental projects dealing with small issues related to corporate functioning, processes improvement, work area and quality improvements along with human resource development (Bessant, Caffyn, Gilbert, Harding, & Webb, 1994). Employees cross-functional teams are formulated to solve a designated problem in limited time frame (Doolen, Van Aken, Farris, Worley, & Huwe, 2008). Gradually, a lot of little improvements add up to huge gains for the organization. Originally this concept was developed by USA. After World War II, it was transferred to Japan (Bhuiyan & Baghel, 2005). Japanese companies not only adopted but also enhanced this concept further(Kenney & Florida, 1993a; Oliver, Delbridge, & Lowe, 1998).

As per Laraia, Moody, and Hall (1999) the concept of Kaizen was originally developed for improvement of manufacturing process to enhance the quality of the products, especially in auto mobile sector of Japan. Now this concept is widely practiced in service sectors as well as in

other spheres of life. This concept was crystallized in Toyota production system (Ōno, 1988). Toyota gained recognition in the international market due to its high quality products as a result of implementation of Toyota production system including Kaizen. Many other Japanese companies have also adopted Kaizen to improve their processes, quality of the product and overall performance enhancement of their organization and became a learning organization. Kaizen has become one of the sources of competitiveness of Japanese manufacturing industries (Imai, 1986c).

During the initial phase of Kaizen implementation, organizations use certain types of workshops in order to improve the production process. These workshops were called Kaizen event (Glover et al., 2011). Workers of a certain area or production line organize themselves and participate in a Kaizen event in order to improve the efficiency of their own working processes. This type of workshops must be conducted on regular basis for successful implementation of Kaizen and to get sustainable competitive advantage that remains safely proprietary (Schroeder & Robinson, 2002). A competitive advantage gained through long history of Kaizen is the most secure because the series of incremental steps and the ability to continually improve the processes by the organization cannot be copied by competitors.

Since 1980, awareness level and implementation status of Kaizen as CI philosophy have been increasing throughout the world (Cua, McKone, & Schroeder, 2001). Organizations are trying hard to compete the international market through CI in their performance and quality of their product (Choi, Rungtusanatham, & Kim, 1997). Because of the global competition among firms and awareness of the customers, there is a lot of pressure on manufacturing as well as on service providing organizations of the world to improve their internal processes, quality of their product, work area and develop their human resource.

In order to compete contemporary organizations, CI in all areas of the organization is necessary (Malik & YeZhuang, 2006). CI means an ongoing effort to improve socio-technical system including quality of products, improvement of process, work area and development of human resources of the organization (Singh & Singh, 2009). Benefits of implementation of Kaizen as CI philosophy are widely recognized throughout the world; however, sustaining CI momentum has proven to be very difficult (Bateman & David, 2002). Practitioners have highlighted a number of socio-technical outcomes of effective implementation of Kaizen. These

include improvements in internal processes, human resource development, better utilization of floor space, reduction in lead time, less Work In Process (WIP), reduction in setup time, walk time, reduction in defect rate and on time delivery (McNichols, Hassinger, & Bapst, 1999). Hill Rom's (hospital bed manufacturing industry of UK) has increased its productivity by 25%, reduced its cycle time by 25%, WIP level by 90% and its floor space utilization by 77% through effective implementation of Kaizen (Singh & Singh, 2009).

Many researchers have conducted research on effective implementation of Kaizen in manufacturing / service providing organizations of different countries of the world. White & Trevor (1983) were of the opinion that a Japanese management philosophy, such as Kaizen is fixed for Japanese culture and is difficult to be implemented effectively in other countries of the world. On the other hand, others concluded that some of the rational features of Japanese management practices can be effectively implemented outside Japan. Few recent studies indicate that Japanese management philosophy Kaizen can be effectively implemented through hybridization with locally practiced management techniques (Aoki, 2008).

Taylor (1999) examined implementation of Japanese management practices in China. Saka (2004) discussed transferability of Japanese operation management techniques including Kaizen to the UK. Kenney and Florida (1993b), looked at the transfer of Kaizen to USA. The results of these studies were of mixed nature. They concluded that Japanese management approaches were partially successful in countries outside Japan. There were ample evidences that companies are implementing Kaizen for CI of both productive and non-productive activities (Jung & Wang, 2006); (Marin-Garcia, del Val, & Martín, 2008). However successful implementation of Kaizen remains a challenge for these organizations (Choi et al., 1997; Lillrank, Shani, & Lindberg, 2001). Cases of successful implementations of Kaizen are across the industry spectrum, ranging from the automotive to food and furniture manufacturing industries (García-Lorenzo & Prado, 2003; Marin-Garcia, Garcia-Sabater, & Bonavia, 2009; Prado, 2001). Whereas intelligence unit of the Economist (1992) stated that Kaizen program in many organizations of the world has failed.

In Pakistan, Kaizen started gaining importance during 1990's after increased popularity of ISO 9000 quality management system and standards (Moosa, 2009). Some practitioners claimed success stories of Kaizen implementation in their organizations at different forums

especially in international convention on quality improvement (ICQI) held at various cities of Pakistan. However, the results of study carried out by (Moosa, 2009)indicate that Kaizen in Pakistani industries is not being implemented successfully. Organizations in Pakistan are trying to implement Kaizen concepts it is implemented in Japan, but these efforts are partially successful (Malik, Li-bin, Ye-zhuang, & Xiao-lin, 2007). Many of the Pakistani automobile sector organization are realizing that through effective implementation of Japanese management techniques such as Kaizen and lean production system, the productivity and quality can be enhanced. Effective implementation of Kaizen will improve their internal processes and develop human resource of their organization. Kaizen activities in Pakistani automobile sectors organization are less as compared to the developed countries of the world such as, Japan, China, Spain and USA (Malik et al., 2007).

Kaizen is simple to conceptualize but it is difficult to implement (Bessant, Caffyn, & Gallagher, 2001a). Different factors such as lack of commitment from top management, cultural change, lack of training of worker on Kaizen tools and techniques, nonexistence of system of Rewards and Recognition (RR), lack of Personal Initiative (PI) from internal customers of the organization and lack of experience on Kaizen Event and Team Design (KETD), contribute toward non-effective implementation of Kaizen in these organizations and need to be analyzed empirically (Malik et al., 2007). Effective implementation of Kaizen requires that the concept of Kaizen be understood clearly and different factors affecting Kaizen must be identified. Some of the enablers and prohibitors as identified from literatures review are given here; active participation and commitment from top management, personal initiative from workforce, development of the system of rewards and recognition to the participants of Kaizen, development of Kaizen culture in the company, careful selection of improvement areas as projects and Kaizen team, training of the workforce and establishment of CI process, management and measuring systems (Baidoun, 2003; Brunet, 2000; Farris, Van Aken, Doolen, & Worley, 2009; Glover et al., 2011; Shimizu, 1999; Singh & Singh, 2009; Waeytens & Bruggeman, 1994).

Management style, understanding and training level of workforce of Pakistani organizations do not encourage empowerment of workforce and their involvement in Kaizen activities of the organization (Malik & YeZhuang, 2006). Jørgensen, Boer, and Gertsen (2003), have identified factors such as lack of personal initiative (boldness) and motivation level (willingness) of workers, lack of commitment from management (involvement), lack of

development of Kaizen culture (supportiveness) in the organization, nonexistence of establish strategy for CI, lack of training / understanding level of workers on Kaizen tools and technique (knowledge), incompetency of middle and lower management in design of Kaizen event (competency) as a cause of non-effective implementation of CI activities in the organization. Effect of these factors on effective implementation of Kaizen in the automobile sector's organizations of Pakistan has not been confirmed through empirical analysis in the literature. Lillrank et al. (2001), in his research study highlighted that, the active participation and motivation (willingness) level of workforce, management commitment to Kaizen activities is necessary. Employees should be able to make improvement (knowledge), must be supported from their top management (involvement) given sufficient knowledge of KETD, tools and techniques, resources and a good strategy for successful implementation of Kaizen in their organization.

Bessant, Caffyn, and Gallagher (2001b) set forth an evolutionary model of continuous improvement consisting of various stages, the abilities present within each stage, and the sources of failure in the sustainability of the Kaizen. Wu and Chen (2006) in their model cover the limitation/ weakness observed in (Bessant et al., 2001b) model; however, this model also does not explain effects of many organizational (internal as well as external) factors affecting effective Kaizen implementation in an organization. Although these models have been around the world in the past, but most organizations still lack many of the behaviors and routines cited as important and are far from reaching the more advanced levels of Kaizen. Therefore, it is important to have first-hand information about how companies can effectively implement Kaizen and organize CI activities throughout the organization.

This research presents results of an empirical analysis of data obtained from 173 respondents from 54 automobile sector organizations of Pakistan which are implementing TQM or Kaizen tools and techniques for CI of their performance. In this research, in depth analysis of different factors affecting Kaizen implementation and the relationship between selected variables has been carried out to formulate a workable framework of Kaizen implementation. On the basis of result of Pearson correlation test and linear regression models developed for each dependent variable of Kaizen a framework has been developed for CI of internal processes, quality, human resource development through Kaizen and overall success of Kaizen in automobile sector organizations.

1.2 **Motivational Rational of the Research Study**

There was a lot of investment in automobile sector of Pakistan by private sectors in recent past. As per Federal Board of Revenue (FBR) report (2014), there was turnover of 612 billion rupees in automobile sector of Pakistan and its contribution in taxes was Rs. 173 billion. Contribution of this sector in overall GDP of the country was 2%; whereas, its contribution in overall manufacturing sector of Pakistan was 18%. This sector is providing employment to 2 million people of Pakistan. As per Pakistan Automobile Manufacturing Association (PAMA) report (2014), production of different types of vehicle from automobile sector of Pakistan is less as compared to their installed capacity. Last six years production along with installed capacity of main automobile manufacturing organizations of Pakistan is given in Figure 1.1.

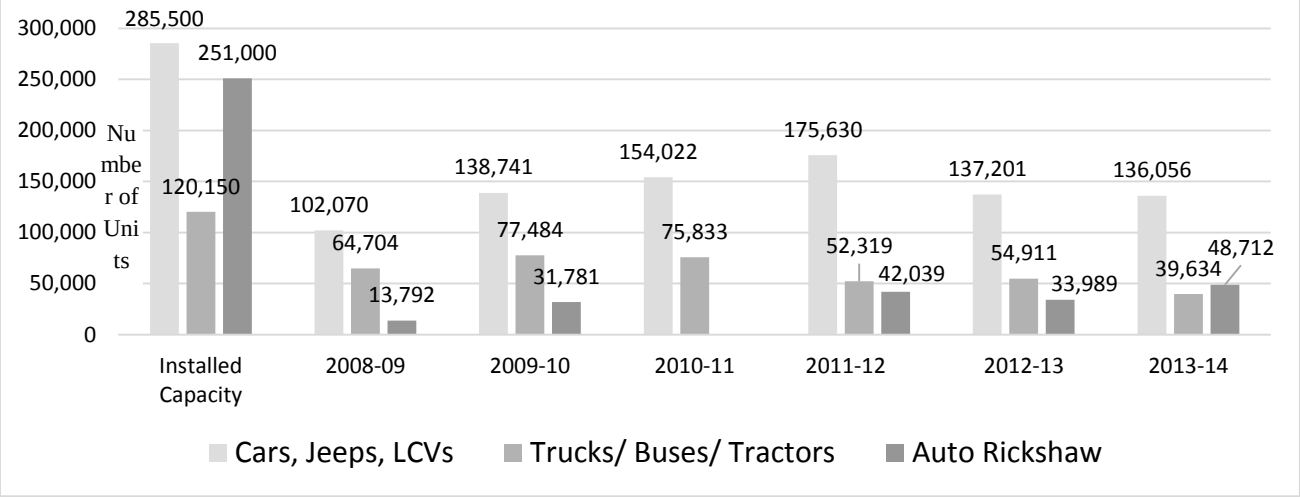


Figure 1.1: Overall Year Wise Production Performance of Auto Sector of Pakistan

Source :- (Pakistan Automobile Manufacturing Association (PAMA) Report, 2014)

The bar charts shows that automobile industry is far behind its installed capacity and there is a lot of room available for improvement of performance of this sector. It needs special attention of researchers to suggest measures for the improvement in the performance of this sector. Continuous improvement of process, quality of product, work area and development of human resources through accepted norms in their respective areas is the prime consideration of each organization. Different philosophies have been adopted by the organizations at national and international level to achieve this objective.

Pakistan is a developing country. Its economy primarily depends upon agriculture and industrial sectors. It is very difficult for Pakistani auto industries to spend enormous money on innovation of new technology for the improvement of productivity of their organizations. Therefore, these organizations prefer to implement Japanese management philosophy such as Kaizen for small continual improvements in their internal process, product quality, work area, overall increase in performance of their organization.

Automobile sector's organizations can increase their performance through effective implementation of Kaizen in order to survive and prosper in this competitive environment, even if they do not intend to become "world class" enterprises (St-Pierre & Raymond, 2004). Sense of CI in productivity, quality and development of human resource, improvement in work area and organization internal processes through Kaizen in Pakistani organizations is increasing. Effective implementation of Kaizen ensures, improved product quality, and reduced cost through elimination of waste in the form of non-value added activities, improvement of processes and developing human resource of the organization by enhancing their skill level, knowledge and attitude. Thus, it contributes to the overall success of the organization (Manos, 2007). Through effective implementation of Japanese management philosophy Kaizen and lean production system, automobile sector's organizations can continuously increase their socio-technical performance (Gunasekaran, Putnik, St-Pierre, & Delisle, 2006).

Keeping in view the tremendous contribution of automobile sector in economic development of Pakistan and the fact that primarily Kaizen was developed and implemented by automobile sector of Japan, this sector was selected for survey of the organizations for collection and empirical analysis of data to develop a framework for effective implementation of Kaizen. Another reason for the development of framework for effective implementation of Kaizen in automobile sector organizations is that these organizations are producing variety of parts and equipment with low volume. They have to produce a large variety of defect free products with short lead time in an economical way. In such a situation, one time innovation in machine or technology cannot solve the problem of continuous improvement of performance. Effective implementation of Kaizen philosophy is the way which can be helpful for such type of manufacturing as well as for service providing organization to enhance their productivity and quality of their work (Manos, 2007).

Thirdly, being mostly dominated by Japan based companies the automobile sector of Pakistan has greater potential than other companies to benefit from Kaizen but often the Kaizen implementation's requirement are unknown to them or at least perceived as such. Kaizen is being implemented in most of the organizations related to automobile sector of Japan. The share of Japanese base automobile companies and their subsidiaries in Pakistan is more than any other company of the world. Therefore, they have more chances to implement Kaizen effectively in Pakistan. According to Pakistan Engineering Development Board Report (2014), the share of Japanese and non-Japanese companies in automobiles sector of Pakistan is given as follow:

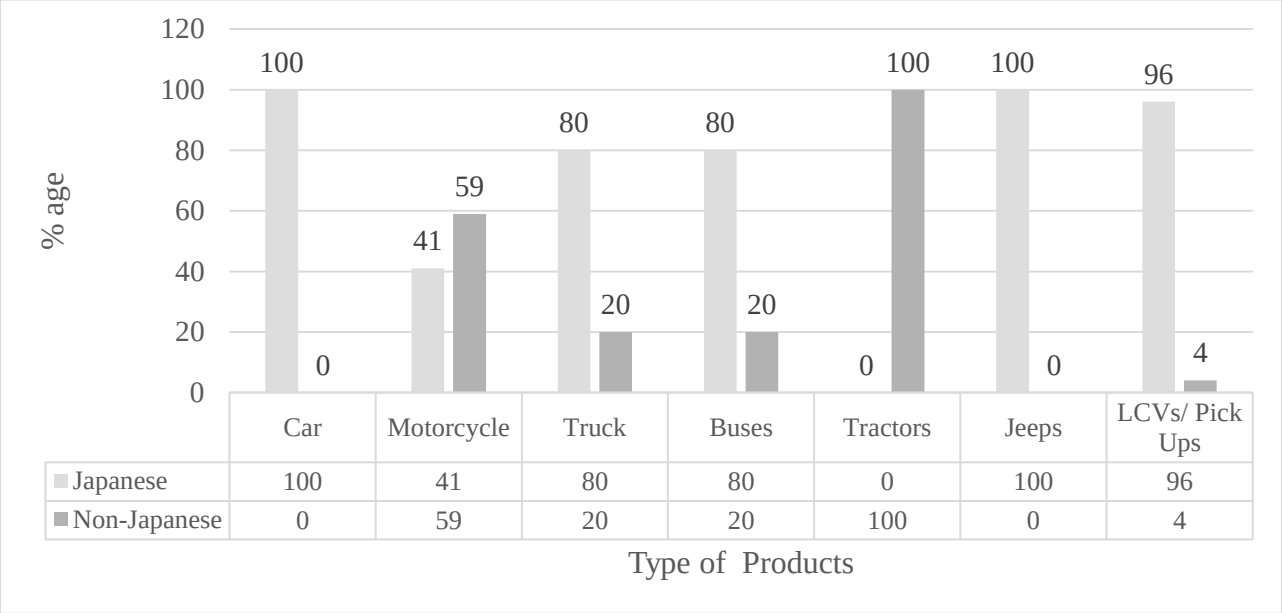


Figure 1.2: % age Share of Japanese Companies in Automobile Sector of Pakistan

As per PAMA Annual Report (2014), Company wise market share of auto mobile industry producing cars, buses, LCVs and motorcycles shown in Figure1.2 indicates that market is dominated by Japanese companies except motorcycle, where Japanese share is 41%. The detail pie charts showing market share of different companies operating in Pakistan and manufacturing Cars, Buses, Light commercial Vehicles (LCVs) and motorcycles are shown in Figure 1.3.

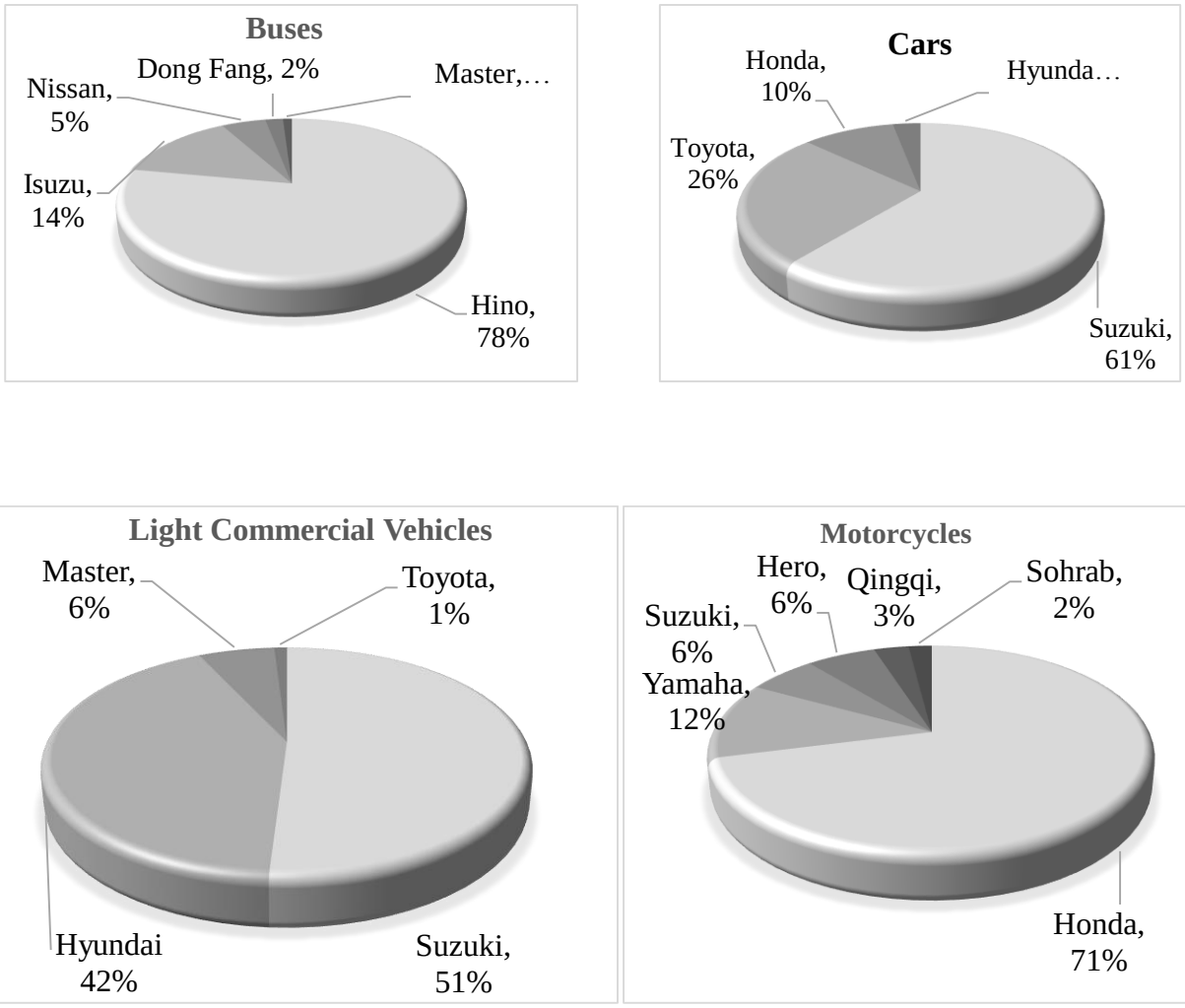


Figure: 1.3 Market Share of Different Automobile Manufacturing Companies of Pakistan Assembling Cars, Buses, LCVs and Motorcycles.

Source: - (PAMA Annual Report, 2014)

As per the research carried out by (Moosa, 2009), 80% organizations of Pakistan have poor awareness level of Kaizen, 10% organization have satisfactory level of awareness whereas only 10% organization have good awareness related to Kaizen concept. The implementation standard of Kaizen in 85% Pakistani organizations is poor, in 5% organizations it is satisfactory, whereas only 10% organizations have good standard of Kaizen implementation. There are research studies indicating partial success or the failure of implementation of Kaizen Philosophy in different organizations of the world.

Effective implementation of Kaizen to improve the performance of the organization depends on many factors such as organizational Kaizen culture, training of employees on Kaizen tools and techniques, top management commitment, personal initiative of employee and design of Kaizen event and team (Farris, 2006). Practitioners in Pakistan have pointed out that a lot of manufacturing organizations are interested to implement Kaizen but could not do so, because of confusion in understanding and non-availability of Kaizen culture in Pakistani organizations. Effective implementation of Kaizen in Pakistani culture needs immediate attention of the researchers. In this perspective, there is a need to understand the Kaizen Philosophy and identify different factors affecting Kaizen to develop a framework for its effective implementation in automobile sector organizations of Pakistan.

There is very little empirical research found in literature related to the relationship between key factors affecting Kaizen implementation and its outcomes in an organization (Farris, 2006). Furthermore explicit link between Kaizen implementation and related organizational theory has not been established previously (Hellsten & Klefsjö, 2000). Bessant et al. (2001b) have developed a five stage CI maturity model for the organizations. In this model the researchers have divided the organizations in five stages based on the CI activities. No empirical analysis of variables have been carried out in Bessant's model (Bessant et al., 2001b). Farris (2006) has identified different critical factors related to Kaizen event only. In this framework the researcher has not covered the organizational internal factors such as organization top management commitment, Kaizen culture, training of workers, rewards and recognition, personal initiative of employees affecting Kaizen implementation in an organization. Wu and Chen (2006) developed a CI model addressing the limitation of Bessant & Caffyn model. Their models discussed a pyramid consists of three elements such as problems, tools, promotion and interaction between them. Malik and YeZhuang (2006) generally approach different critical factors affecting CI as an exploratory case studies and no empirical analysis related to key factors and their correlation with outcome variables of Kaizen implementation has been done by the researchers.

1.3 **Problem Statement**

A problem is defined as difference between expectation and reality. For a potential problem the most important thing is to identify it and then effectively root out its

causes. It is necessary for the organization to clearly identify a problem before its elucidation. Performance and quality of the product of each organization need CI in order to fulfill the fluctuating requirement of customers. Organization can gain competitive advantage through CI activities, which can be achieved through effective implementation of Kaizen philosophy in these organizations. Automobile manufacturing and service providing organizations, especially the multinational companies of Pakistan are taking more interest in effective implementation of Kaizen for CI of quality of their products, improvement of internal processes, work areas and for the development of their human resource (Moosa, 2009). Effective implementation of Kaizen is a challenge for companies operating in Pakistani culture. The effective implementation of Kaizen depends on numbers of factors known as independent variables, process variables and outcome of Kaizen (Bessant et al., 2001b; Manos, 2007). Therefore, there is a dire need to carry out an empirical research on relationship among key factors of Kaizen as identified through literature review and on the bases of strength of relationship, development of a framework of input and outcome variables for effective implementation of Kaizen in automobile-sector of Pakistan.

1.4 **Research Questions**

Empirically analysis of relationship among key factors identified through literature review and survey, affecting Kaizen, to develop a framework for its effective implementation in automobile-sector organizations of Pakistan. Different sub questions formulated from this main research question are given as under:-

a. What are different key factors in the form of IVs, PV and DVs of Kaizen affecting its effective implementations in an organization?

b. Do factors such as Top Management Commitment (TMC), Organization Kaizen Culture (OKC), Personal Initiative (PI) taken by employees, Rewards & Recognition (RR), Kaizen Event & Team Design (KETD) and Training of Workers (TOW) on Kaizen tools and techniques have direct relationship with outcome variables of Kaizen implementation in an organization?

c. Do Kaizen process factors such as Employee's Commitment to Kaizen (ECK), Action Oriented Kaizen (AOK), Employees Knowledge of Kaizen Tools & Techniques (EKTT) and Standardization of Organizational Internal Process (SOIP) have direct relationship with outcome variables of Kaizen?

d. What is the best suitable multiple regression model for each outcome variable of Kaizen "human resource development, work area improvement, product quality improvement, organization internal process improvement and overall success of kaizen?

e. Do the process variables mediate the relationship between IVs of Kaizen and Overall Success of Kaizen?

f. What is the framework of strongly correlated factors of Kaizen for its effective implementation in an organization?

Survey and correlational method was adopted to find a solution of these research questions. Data for the empirical analysis was collected through survey by measuring perceptions of individual respondents from automobile-sector organizations implementing Kaizen tools and techniques. The research was carried out to refine the working theory on Kaizen implementation.

1.5 **Objectives of Research Study**

The primary purpose of this research study is to identify Key Input and outcome factors of Kaizen and find the relationship among these factors to develop a framework for effective implementation of Kaizen. Framework was required to be develop, basing on correlation and linear regression model developed for each outcome variable of Kaizen. The research is focused on the identification of key factors affecting Kaizen implementation in an organization. Critical factors, capable to enhance or delay Kaizen implementation were identified through literature review and survey of the automobile-sector organizations. This research is aimed to help the management to formulate strategies for effective implementation of Kaizen in their organizations. The main objectives formulated for current study are given as under:-

a. To identify key input factors, process factors and outcome factors of Kaizen from literature review.

b. To identify direct relationship of input and process factors of Kaizen with its outcome factors.

c. To develop best suitable multiple regression model for each outcome factor of Kaizen such as "human resource development, work area improvement, product

quality improvement, organization internal process improvement and overall success of Kaizen.

d. To verify that the Process factors mediate the relationship between input factors and overall success of Kaizen.

e. To develop a framework of Kaizen for its effective implementation in automobile sector of Pakistan.

1.6 Research Hypotheses

In order to achieve the above mentioned research objectives, certain hypotheses were formulated. These hypotheses were formed on the bases of the research framework shown in Figure 1.4. The research hypotheses are as follows:-

Hypothesis 1**:** Each Input factor of Kaizen such as TMC, OKC, PI, RR, TOW and KETD has direct relationship with each outcome variable of Kaizen such as HRD, WAI, OIPI, PQI & OSK.

Hypothesis2**:** Each process factor of Kaizen such as AOK, ECK, EKTT and SOIP has direct relationship with each outcome variable of Kaizen such as HRD, WAI, OIPI PQI and OSK.

Hypothesis3: Input Factors of Kaizen such as TMC, OKC, PI, RR, TOW and KETD have contribution in variation in outcome variable of Kaizen such as; HRD, WAI , OKC, PI, RR, TOW and KETD.

Hypothesis 4: Input Factors of Kaizen such as TMC, OKC, PI, RR, TOW and KETD have contribution in variation in OSK in an organization.

Hypothesis5: At organizational level Factors under PVs mediates the relationship between IVs of Kaizen and OSK.

1.7 Hypothetical Framework

The conceptual research framework was developed after making thorough review of the literature and identifying key factors that influence the successful Kaizen implementation. The hypothetical research framework is shown in Figure 1.4.

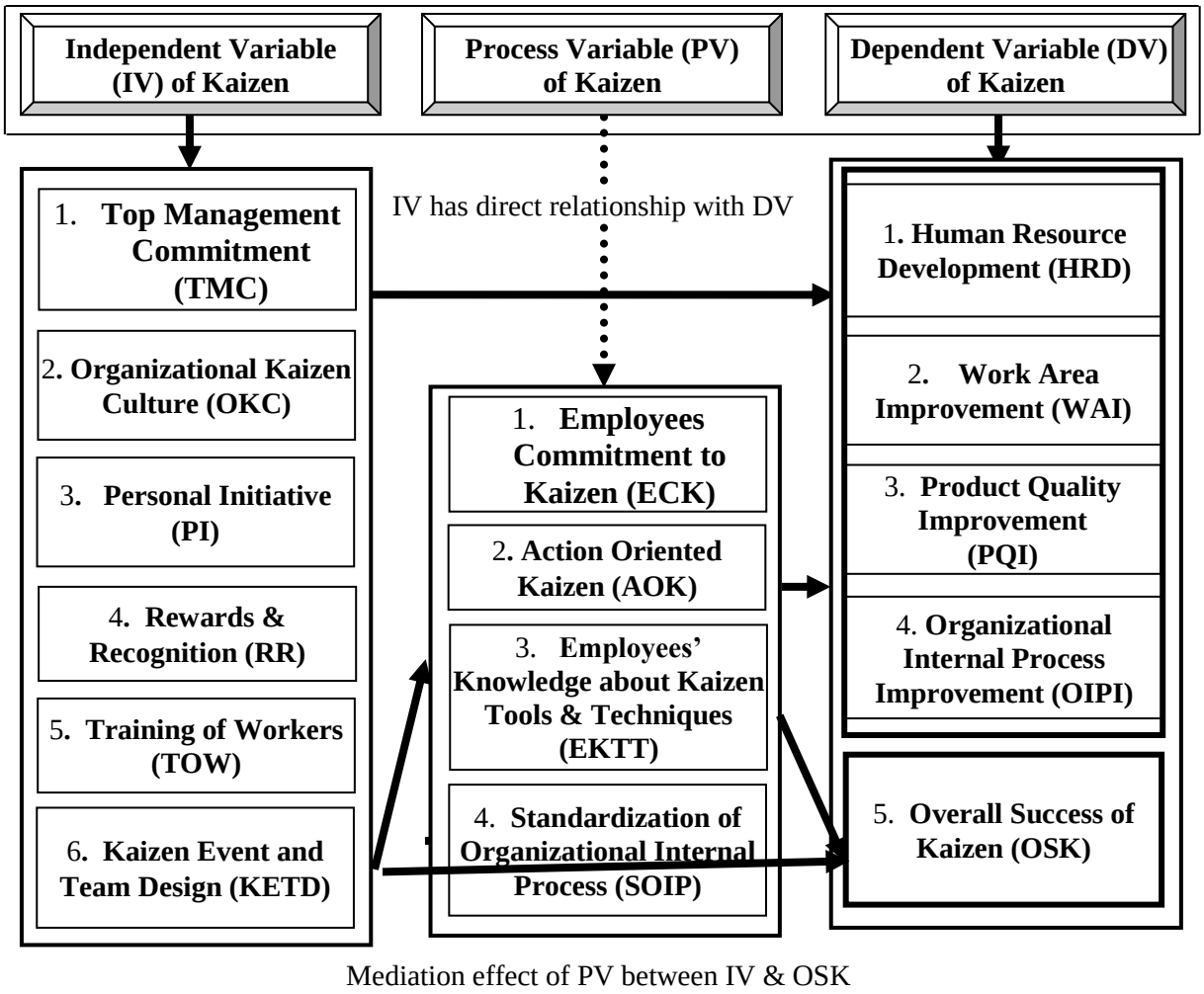


Figure 1.4: Hypothetical Research Framework for Effective Implementation of Kaizen

1.8 Research Approach

An overview of the research design selected for this research was cross sectional (correlation) multisite field study. Manufacturing and service providing organizations from automobile sector of Pakistan were surveyed to measure perceptions of respondents regarding independent, process (control) and dependent variables of Kaizen. Survey questionnaire, consisting of two parts, was designed by tailoring the existing survey questionnaire found in the literature to fulfill the requirement of this research. Survey was conducted in two phases. Part-I of survey questionnaire was circulated during Phase-I of the survey. Organization implementing kaizen tools and techniques for CI of performance and Key Factors affecting Kaizen were identified during Phase – I of the survey. Part-II of Survey Questionnaire was circulated among

automobile sector organizations of Pakistan implementing TQM or Kaizen tool and techniques. Survey response in the form of perception of individuals' respondent from top management, middle management, quality assurance department as well as from shop floor, who have participated in Kaizen activities, was measured. The perception of the respondents was measured in the form of Likert scale ranging from 1 to 5. Empirical analysis of the data collected through survey was carried out to develop a framework for effective implementation of Kaizen in automobile-sector organizations of Pakistan. This whole process is shown in Figure 1.5.

Statistical analysis of the data collected through survey was carried out through Pearson correlation and linear multiple regression analysis. In this research, analysis of the correlation between independent and dependent variables, process and dependent variables of Kaizen was carried out through Pearson correlation test. Similarly a regression model for each dependent variables of Kaizen was developed through multiple regression analysis. Mediation effect of process variables between independent variables and overall success of Kaizen in an organization was confirmed through hierarchical multiple regression analysis. The results of the research confirm the hypothesis established earlier in section 1.6. Empirical analysis of quantitative data shows that there is a positive correlation between selected independent and outcome variables as well as between process and outcome variables of Kaizen identified through literature review. The regression model for each dependent variable of Kaizen shows that dependent variables are affected by selected independent variables of Kaizen. The process variables of Kaizen act as partial mediators between independent variables and overall success of Kaizen in an organization.

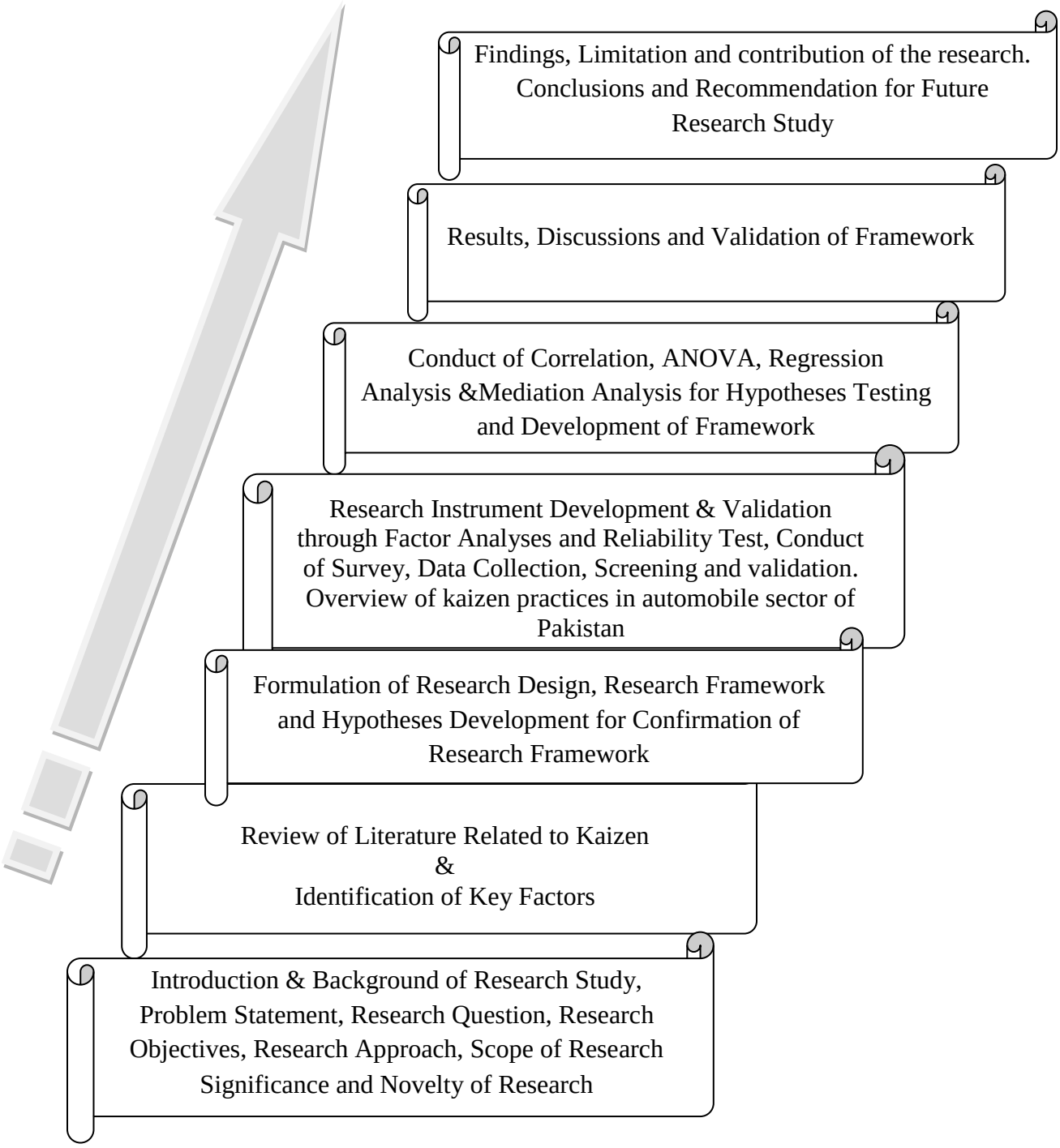


Figure 1.5: A Sequential Depiction of the Development of Research Study

1.9 Scope of Research Study

There were multiple external and internal factors affecting successful implementation of Kaizen in automobile-sector organizations of Pakistan. The external factors such as external customers demand, legal issues, environmental issues at national level, lack of strict compliance of government policies and laws, non-availability of standards for checking quality of product at government level and financial issues have not been considered in this research. Variables whose empirical analysis has not been carried out previously were identified and selected for this research. The scope of research study was restricted to fifteen variables. Six independent variables, four process variables and five dependent variables were selected for this research. Comprehensive empirical analysis of these fifteen variables of Kaizen has been carried out to find out correlation amongst independent and dependent variables of Kaizen and mediation effect of process variables on relationship between these selected independent variables and overall success of Kaizen in an organization.

Finally, collection of data for research was restricted to only those organizations which were implementing TQM / Kaizen tools and techniques to some extent and confirmed through 1st phase of the survey of the organizations. Since, in Pakistan automobile sectors organizations are mostly Japan-based or their subsidiaries working as OEM. These organizations are implementing TQM / Kaizen tools and techniques to some extent. Sample size of 97 automobile sectors organizations which were implementing TQM or Kaizen tools and techniques were selected for Phase-II of survey. For the purpose of study related to management sciences sample size of 97 organizations was moderate (Furlong, 2000). There are many similar research studies where the sample size ranges from 8-13 organizations are widely accepted and cited in the literature. In order to increase the sample size, multiple respondents from top, middle management as well as from Kaizen team members and Kaizen team leaders from shop floor workers of the organizations were included from each organization.

There was another limitation regarding collection of data in the form of measure of perception of individuals through survey of the organization. There is always a chance of error in measuring perfect perception of respondents from the organizations through survey questionnaires. Although, the consistency and validity of survey scale items was confirmed

through factor analysis and calculations of Cronbach's alpha values for each factor. However, margin of error always remain there in social sciences research carried out through survey.

1.10 Contribution and Novelty of this Research Study

This research study has contributed to general body of knowledge related to effective implementation of Kaizen in automobile organizations of Pakistan. It increases knowledge of Kaizen practitioners and engineers working in industries. The result of the research will enhance the understanding level of employee's regarding effective Kaizen implementation in their organization. The results of the research identifies the key factors affecting Kaizen used to develop a framework for its effective implementation in automobile sector organizations of Pakistan. The research will contribute to an empirically tested theory of Kaizen through identification of key variables strongly correlated with outcomes of Kaizen. Following are the unique contributions of present research in effective implementation of Kaizen body of knowledge:

a. Through this research study, regression model for each dependent variable of Kaizen such as HRD, OIPI, PQI, WAI & Overall Success of Kaizen in an organization has been developed. These regression models identified critical factors which contribute significantly in each outcome variable of effective implementation of Kaizen. Through these regression models, organization can concentrate on critical factors to improve work area, product quality, organization internal processes and overall success of Kaizen in their organization.

b. Through empirical analysis, this research has proved that the process variables of Kaizen implementation, as identified through literature review partially mediate the relationship between independent variables and overall success of Kaizen in an organization. This result will also help organizations to concentrate on main contributor variables for successful implementation of Kaizen.

c. The regression model developed through this research uses a sample size of 54 organizations. In previous research carried out by the (Bateman, 2005) sample size was taken as 40 and (Glover, 2010) has taken 8 organizations as sample size for empirical research on sustainability of Kaizen event. The large sample size

used in this research study for hypotheses testing ensures the robustness of the research framework.

d. In this research study multiple regression analyses were used to test the causal relationship between independent and dependent variable of Kaizen by using data collected through field organizational survey. To the author's knowledge this is the first study based on actual field survey of the organization to seek the perceptions of respondents and used to test different hypotheses formulated for this research study through confirmation of relationship between independent and dependent variables of Kaizen implementation.

e. Survey scale developed and validated through this research will be helpful for future research on Kaizen implementation in any organization for the improvement of internal processes, work area and quality of their products. The data collection and analyses tools and techniques developed for this research will help the researchers to use these tools to measure perception of individual respondents regarding effective implementation of Kaizen in other sectors organizations for future research.

f. The results of this research contribute to the knowledge of practitioners, engineers and Kaizen team members implementing Kaizen in their organizations. The results of this research clearly identify key elements to the management of the organization so that they can concentrate on important factors affecting Kaizen implementation to make Kaizen implementation successful in their organizations.

g. Last but not least the present research also makes contribution to engineering management, operation management and industrial engineering by the enhancement of knowledge body related to improvement of productivity of organizations by identification of Mudda (Waste) and its elimination through effective Kaizen implementation. This research contributes to body of knowledge related to improvement and change because it empirically tests a model that was adopted from a generally accepted model in the organizational change literature, but has not been empirically tested earlier.

1.11 Thesis Organization

The **first chapter** includes the introduction of research study, background and motivational rationale of the research, problem statement and research questions, purpose and objectives along with formulation of different hypothesis to achieve these objectives. Then the conceptual research framework, scope of research and novelty of the research is highlighted.

The **second chapter** consists of literature review related to definition of Kaizen and Kaizen philosophy. Existing knowledge on Kaizen has been analyzed and presented with focus on identification of different factors related to Kaizen on development of framework for effective implementation of Kaizen. Key variables affecting Kaizen and different outcome variables of effective implementation of kaizen in an organizations were identified through literature review. Independent, process and dependent variables proposed for the research framework, related to effective implementation of Kaizen were discussed. Different existing model / frameworks of CI in Kaizen literature along with their limitations have been explained.

Chapter three describes detailed research methodology, which includes, research design, research questionnaire, ethical consideration, pilot study, sampling and assessment of framework. It also includes explanation related to dependent and independent variables identified for this research. **Chapter four** analyzed automobile sector of Pakistan and the results of Phase-I of the survey. **Chapter five** provides the results and analyses of the Phase-II of survey of research study and its overall implication. **Chapter six** includes discussion on findings of the research and novelty of the research work, conclusions and future recommendations. At the end of the thesis, different annexures and appendix are attached along with references cited in the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter consists of literature review linked with basic theory of Kaizen, its history, benefits and differences with innovation, Kaizen event & total quality management. Analysis of key factors, models / frameworks related to effective Kaizen implementation for continuous improvement of an organization has been made. Protocol for selection of literature related to Kaizen and Kaizen implementation has been defined. Definition of Kaizen has been established through literature review. Critical factors influencing the effective implementation of Kaizen along with its outcome in the form of socio-technical benefits such as work area improvement, process improvement, human resource development, quality improvement and overall success of Kaizen in an organization have been identified through review of the literature. Frameworks developed by different researchers have been analyzed. Literature for this research is arranged in such a way that research framework components and basic concepts of Kaizen have been given priority over general body of knowledge. At the end of this chapter specification of the different variables of proposed research framework has been explained.

2.2 Systematic Literature Review

This research follows the systematic review process for management research as illustrated in Table 2.1 adapted from (Tranfield, Denyer, & Smart, 2003). A systematic literature review differs from a traditional literature review because it defines and uses a detailed, formal protocol to identify the studies to review and also uses a set of a criteria to assess the quality of the selected studies, both of which may not be included in a traditional literature review. A full systematic review typically includes a researcher identifying studies to include in the review and extracting and synthesizing data from the selected studies for further analysis. This research uses 5 different phases for the systematic review process in order to present a compelling motivation for the review of literature associated with Kaizen theory and development of framework for its effective implementation in an organization.

Phase-1 is presented in Table 2.1. The lack of empirical research related to development of Kaizen implementation framework, highlight the need for further research in the area. During Phases 2-5 of the systematic literature review, conducted by building upon a Kaizen concept and discussion on available framework of Kaizen, literature review conducted by (Farris, 2006) to

support the inclusion of additional measures on Kaizen framework development. The details of systematic review process are shown in Table 2.1.

Table 2.1: Phases of Systematic Literature Review

Phases	Systematic Review
1	Review of literature related to Kaizen and framework / model for its effective implementation
2	Proposal literature review preparation
3	Review protocol development
4	Research identification
5	Criteria development and selection of studies for literature review
6	Quality assessment of studies

2.3 Development of the Literature Review Protocol

Table 2.2 includes the review protocol used to identify the selection of the studies for the development of framework for effective implementation of Kaizen in an organization. Because Kaizen implementation framework literature is limited, this systematic review also included studies that examine Kaizen with respect to continuous improvement methods. These additional areas were included in the research because Kaizen is a process improvement method (Alukal & Manos, 2006) and the sustainability of Kaizen is often linked to other continuous improvement approaches, specifically Lean (Bateman, 2005). The review protocol for systematic literature review is shown in Table 2.2.

Table 2.2: Development of Systematic Literature Review Protocol

Purposes of systematic literature review	a.	To systematically expand an existing literature review on Kaizen concept (Farris et al., 2009), thus contributing to the understanding of the current Kaizen concept and framework body of knowledge.
	b.	To identify and review additional sources to get information about the study of different variables influencing Kaizen implementation.
Search strategy	a.	Search the identified data bases by specific keywords.
	b.	Search the sources of fundamental papers e.g., (Bateman, 2005) found

		during the initial search.
Exclusion criteria	a.	A study will be excluded from the systematic review of Kaizen if the majority of the study does not address Kaizen concept, implementation framework and different factors affecting Kaizen.
	b.	Remove any duplicates and citations previously found by researcher.
Keywords	a.	Kaizen philosophy, Kaizen implementation framework, continuous improvement, Kaizen event and Kaizen blitz.
	b.	Kaizen implementation in automobile manufacturing sectors case studies
	c.	Rapid improvement workshop; workshop on continuous improvement workshop automobile manufacturing sectors.
	d.	Process improvement and sustainability all fields excluding full text
	e.	Continuous improvement and sustainability all fields excluding full text
Databases	a.	Engineering village, Emerald, Pro Quest, JSTOR, IEEE transactions on engineering management, Books on the subjects.
	b.	Google Scholar (http://scholar.google.com)

Source (Ferris, et al. 2006)

2.4 **Identification and Selection of Research Studies**

In Phase-III, 224 publications on Kaizen philosophy, Kaizen event, Kaizen implementation models and framework for Kaizen implementation were identified using the keyword searches in each selected database. The high numbers of Kaizen publications were due to the Kaizen concept and Kaizen event publications found in the Pro Quest database with the Kaizen event and Kaizen blitz keyword searches included in the full text. These Pro Quest database results also included a number of newspaper and trade magazine articles that sparsely mentioned Kaizen events and Kaizen concept. Therefore, the Pro Quest database keyword searches for Kaizen concept, Kaizen event and Kaizen blitz were adjusted from full text searches to searching the bibliographic citation and abstract. The results of the framework publication search varied greatly and many were related to Kaizen implementation in European, Japanese Indians and Chinese manufacturing industries. Thus the keyword search, institutionalizing change in all fields excluding full text, was added to the review protocol to more accurately sequester relevant publications.

In Phase-IV, the author used the review protocol's exclusion criteria which includes the exclusion of duplicate entries to select new Kaizen implementation-specific studies based on the search results from the keywords. Kaizen philosophy, Kaizen concept and Kaizen event, Kaizen blitz, rapid improvement workshop and accelerated improvement workshop implementation in automobile sectors organizations are the keyword selected for enclosure in the literature review selected for this research. Eighteen sustainability-specific studies based on the exploration through keywords process improvement, influencing factors of Kaizen implementation, development of a framework for CI and "institutionalizing change" were selected for literature review.

2.5 Quality Assessment of Included Literature on Kaizen

Quality assessment of a literature stream was done through many ways. For example, (Neely, 2005) explores the evolution of performance measurement research through a citation/ co-citation analysis method. The frequency with which the top 5% of performance measurement researchers and their individual publications were cited, the types of journals in which the publications appeared, and the frequency of their citations over time were extracted. Neely used social network analysis software, CINET, to determine how often these top researchers were co-cited and how often pairs of keywords were included across the most frequently cited works. The evolution of performance measurement research with respect to the types of articles that are being published (e.g. methods of application and theoretical verification or empirical investigation) is briefly mentioned but the research did not classify each item in the dataset according to their types.

Other quality assessments involve the review and classification of each individual publication in the literature stream. For example, Gattoufi, Oral, Kumar, and Reisman (2004), conducted a quality assessment of data envelopments analysis publications and classified them according to their nature and the research approach.Polekhina et al. (1996), created a framework to categorize business processing reengineering publications according to five classes such as trade press, redesign cases, expert reengineering methodologies, academic investigations and theory-testing works.

The present research did not include a citation / co-citation analysis because of the lack of academic literature in the Kaizen implementation body of knowledge to date. It was expected

that a majority of the Kaizen implementation framework publications would be practitioner resources, so the classification approach was chosen. In choosing the most appropriate classification approach for the dataset, it was observed that many of the selected publications for Kaizen implementation systematic literature review were void of any research methods, did not present data, and were not theory-based. Therefore, categorizing these publications by application versus theory (Gattoufi et al., 2004) yielded very little additional information. Therefore, an adaptation of(Polekhina et al., 1996) framework was chosen as the most informative for categorizing the publications in the development of Kaizen implementation framework research. Table 2.3 reviews the categories and provides the detailed criteria used to categorize each publication in the dataset.

Table 2.3: Classifications for Kaizen Research Dataset (Adapted from Nissan, 1996)

Research Publication classification	**Selection Criteria**
Concentration on selected title	• Shallow coverage of topic • Contributes little specific knowledge
Case studies	• Descriptive works of Kaizen implementation and their general processes • Still little specific knowledge gained.
Expert Kaizen implementation methodologies	• Includes practitioner guides to Kaizen implementation (steps and their order), including specific prescriptions for practice. • Usually produced by consultants in the area.
Academic investigations	• Knowledge creation through the creation of frameworks and guidelines through defensible, extensible, and replicable research that begins to answer operationalized questions such as how to accomplish the steps of a Kaizen implementation. • Includes works that generate hypotheses for further research (e.g., qualitative research and research that presents a working theory of a phenomenon, but does not test the hypotheses presented are academic investigations).

	• A case study conducted by an academician that follows a systematic qualitative research method is still categorized as an academic investigation Empirical analyses of factors and testing of hypothesis.
Theory-testing works	• Explanatory and predictive knowledge to answer why or when Kaizen practices are successful in certain organizations • Must include hypothesis testing (all other academic studies are classified as academic investigations)

A quality assessment was completed using Nissen's classification approach on the new Kaizen specific studies found through the systematic literature search and the pre-existing list of Kaizen event publications(Farris, 2006)to gain a more in-depth picture of the current state of the maturity of the research . This dataset includes works published from January 1986 to June 2013. Approximately 14 authors from the dataset had more than two publications each. The eighteen publications are books or Kaizen implementation manuals, while most publications are in practitioner periodicals.

The percentage of literature review related to different types of Kaizen publication is illustrated in Figure 2.1. The publication case study in the dataset are 16%, e.g. Boeing, Dana Corporation and Freudenberg-NOK were frequent case study examples. The Kaizen implementation methodologies were fairly consistent in emphasizing some Kaizen practices characteristics; for instance, cross-functional teams and action orientation were important (Martin & Osterling, 2007). However, there was dissention among some of the more specific prescriptions, e.g. encouraging management (Martin & Osterling, 2007) or not allowing management (Huls, 2005) to participate in Kaizen activities. Many of the Academic Investigations were academician-conducted case studies that focused on providing practitioner-focused insights and on developing hypotheses for future research(Magdum & Whitman, 2007). The works of Bateman, (2005); B.D. Miller, (2004) &Patil, (2003), is based on Kaizen implementation research efforts and comprise the theory testing publications that focused on hypotheses testing. Kaizen implementation model development includes.

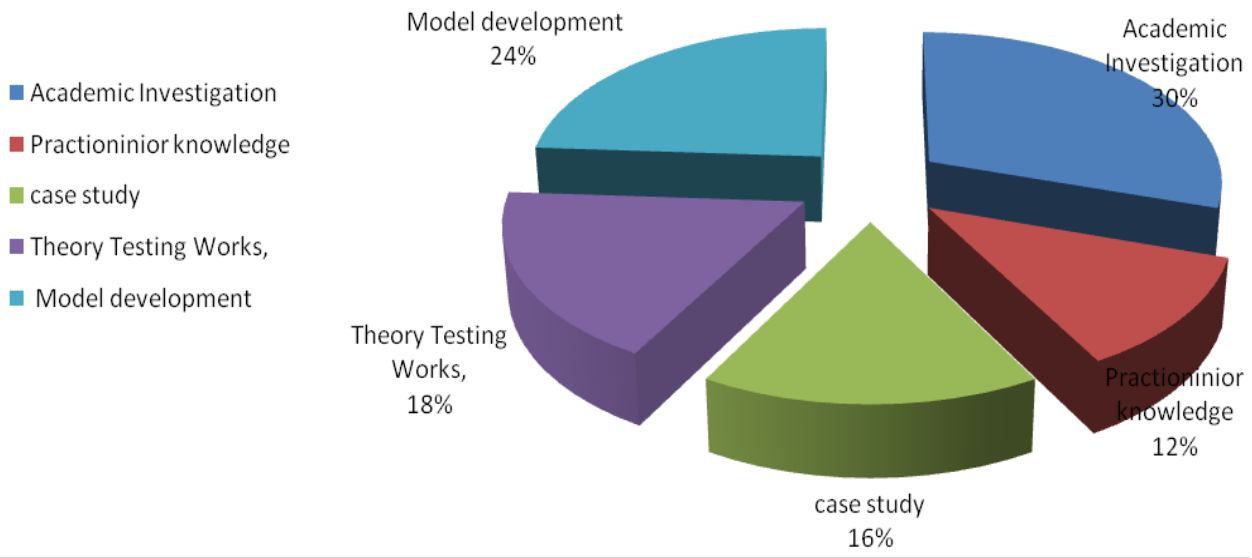


Figure 2.1: Systematic Review of Different Type of Publications from Literature

This quality assessment can also be used to assess the Kaizen research maturity. The maturity of any research stream can be determined by a number of indicators. To obtain a general idea of an area's maturity, one can examine the number of textbooks published in a field or examine the extent to which the field is being applied to other areas (Gattoufi et al., 2004). Field maturity can be assessed by the depth of its research content and its degree of relevance to global industry practices (Sheldon, 2006). To access maturity level of publication normally three maturity characteristics are studied (Cheon, Groven, & Sabherwal, 1993) which include following:-

a. Integration of a diverse set of variables (both explanatory factors and outcomes) to solidify a standard, paradigm, or model

b. Use of multiple methodologies within the field

c. Explanation of phenomena through hypothesis testing with generalizable and inferential methodologies

2.6 History of Kaizen

According toImai (1986c), there are different thoughts regarding Kaizen history. The most common one indicates that Kaizen resulted from competition between Nissan Motors and Toyota Company. In 1961, Nissan Company won the Dr. Deming Prize for Quality, after which

Toyota Company also adopted lean manufacturing approach. Toyota Company decided to win the Deming Prize. Shigeo Shingo elaborated a new technique poke-yoke, in order to solve problems related to quality of the product. After that, Tetsuichi Asaka and Kami Ishakawa in 1962 developed a Toyota Quality Circle in Toyota Motor Japan. Later on, these Quality Control Circles were given the name of "Kaizen event". Masaaki Imai established a Kaizen institute in 1963, which has promoted Kaizen philosophy throughout the world. Masaaki Imai was the first proponent of Kaizen. In 1986 Masaaki Imai wrote a book on Kaizen titled "Key to Japanese competitive success". In his book, Imai has explained the basic concepts, principles and core values of Kaizen in relation to other concept, principle and practices being followed in CI of quality and processes. Kaizen theory was raised in 1986 by Masaaki Imai which explains Kaizen as a CI, perfection in work, processes and layout at places where work is being done (Singh & Singh, 2010).

As per Imai (1986c) Kaizen is a process oriented technique. The first principle of Kaizen is that before improvement of results, processes must be improved. Management should concentrate on developing sound and flawless processes because production result will automatically improve if the processes are good. However, it does not mean that results are not important. Management must develop evaluation criteria to monitor and concentrate on improvement of process itself and acknowledging the outcome of the improved process.

The implementation initiative for the continuous improvement of processes such as standardization, one piece flow and pull processes are also process driven methodologies but these can be copied and described easily without any cultural and behavioral change of employees and management. Kaizen is a process oriented concept which cannot be described and copied easily. It needs involvement of top management, middle management as well as shop floor workers. Kaizen is always implemented from top-down to improve the processes and later it becomes bottom-up approach.

Second principal of Kaizen, as described by (Imai, 1986c), is that continuous improvement can only be achieved, when ongoing efforts to maintain and improved standard performance level is combined with small scale innovation. In other words, Kaizen focusses on small scale improvement of work standards. Kaizen improvements can only be judged where established standards are available. There is always a relationship between Kaizen and

maintained standard operating procedures for different operations.

The third principle of Kaizen suggests that Kaizen is people oriented which means that Kaizen must involve all the employees from top management to the shop floor workers level in an organization. Shop floor workers are involved through asking suggestions for improvement and their participation in Kaizen event is as Kaizen team members. Management and supervisory staff perform the roll of facilitators in Kaizen events.

2.7 Literature Related to Kaizen

Variety of databases were consulted to search the term Kaizen. These databases include Pro Quest, Business Source Premier, Emerald, Business Source Elite, Science Direct and Google Scholar. Books written by scholars and practitioners related to Kaizen were also consulted. Through literature review, it was revealed that Kaizen appears in two different ways, one is the Japanese variants of Kaizen as explained by (Imai, 1986b) and the other version is the Western concept of Kaizen, i.e. continuous improvement.

The first step in the development of framework of Kaizen for its effective implementation is the clarity of the definition of Kaizen. Brunet and New (2003) are of the opinion that there is no universal definition of Kaizen. Its use in literature is contradictory. There are the studies which have tried to look clearly at the definition of Kaizen but most of them correlate Kaizen with different concepts associated with continuous improvement. Since one objective of this research is to provide better understanding of Kaizen concept to its practitioners and researchers, it is necessary to identify or develop a clear definition of Kaizen concept.

2.7.1 The Japanese Variant of Kaizen

There is very less scholarly literature related to Japanese variant of Kaizen. However, different case studies and articles are available in the literature. The most important one is that of (Brunet & New, 2003) related to quantitative research on the impact of Japanese variant of Kaizen on motivation level of staff, studied in Japanese manufacturing plants, implementing Toyota Production System (TPS). Adare et al. (2008) is of the opinion that Japanese version of Kaizen can be implemented to other countries of the world who have different cultures than Japan but they are willing to successfully implement Kaizen in their organizations. According to him, fundamental principles of Kaizen are as follows:

a. Kaizen is employee's initiative based continuous improvement of performance of the organization.
b. Ensures standardization of work.
c. Promotes communication between departments.
d. Bring improvement in process and layout of the organization through identification and elimination of "Mudda".

The term came from Gemba Kaizen which means continuous improvement at work place. Kaizen involves all internal customers of the organization. (Malloch, 1997; Styhre, 2001) are of the opinion that Kaizen is continuous improvement. Brunet and New (2003 p. 1428) describe the ambiguity and disparity of the way Kaizen is stated in the literature. Their point of view about the definition of Kaizen is that "Kaizen consists of all activities identified and carried out by the employees of the organization which has not been precisely given in their contracted role to achieve organizational goals". Hayashi and Tachibana (1994) also gave similar point of view that job description of employees in Japanese organizations is not clearly defined and one person performs so many jobs at a time due to which concept of worker responsibility decreases and the concept of group responsibility increases, owing to which it is easier for the employees to go beyond formal duties. Thus, it can be concluded that Kaizen relates to continuous improvement activities by employees where these activities go beyond the contractual role of the individuals.

Michael Colenso (2000), in his book "Kaizen Strategies for Successful Organizational Change" established different sub-headings for purpose of defining Kaizen as "The aim of Kaizen is continuously improve processes, quality of the product/ services provided to the customer, due to its systematic implementation in the organization". Kaizen improves quality of the existing product, systems and processes. It achieves competitive advantage through reduction of cost and improvement in product / service quality through identification and elimination of root causes of the problem through cross-functional teams that consist of organizational shop floor workers having common goals (McNichols, Brennan, & Middel, 2006).

Measures for successful implementation of Kaizen as defined by(Brunet & New, 2003) have not been recognized in the literature. General measures for Kaizen implementation have been proposed by a number of authors (Claver, Tari, & Molina, 2003; Douglas & Judge, 2001).

These proposed general measures have been used more specifically for total quality management (TQM) and they are not being specifically designed to measure Kaizen concept. These measures also do not come under those items which are as per definition given byBrunet & New, (2003).

2.7.2 **Kaizen Philosophy**

Kaizen is a fundamental principle of lean production system and is considered as one of the most important elements of Japanese management system (Imai et al., 1997). There is substantial amount of vagueness and inconsistency in the literature regarding the explanation of Kaizen concept. Mostly, it is misused as a free lunch of improvement through the suggestions scheme and quality control circle (QCC) formed by the employees of the organization. Many of the researchers believe in the centrality of the Kaizen concept, whereas important books on quality management and production operation management do not give importance to the concept of Kaizen. In literature, there is a misconception and inconsistency regarding exact definition of term Kaizen as it is clear from different terms used for the concept of Kaizen in the literature as small group activities, CI, continual improvement and Kaizen event (Doolen et al., 2008).

Literature related to working principle of Kaizen in manufacturing as well as service sector organization is very less. Especially literature on sustainability of Kaizen is a challenge for the organization (Bessant et al., 2001b). Till now, it is not clear that how the organization will maintain the momentum of the Kaizen activity. Glover (2010) fits this concept in overall management system of target setting for the employees of the organization.

Kaizen gets attention of the researchers being a key element of Japanese manufacturing success. It involves shop floor workers in improvement of internal processes of the organization (Doolen et al., 2008). In order to provide comprehensive description of the Kaizen concept few attempts have been made in the past. Most of the literature explains Japanese concept of Kaizen as implemented by Western companies (Cheser, 1998; Malloch, 1997). Imai (1986b) has explained the Japanese concept of Kaizen, however he could not give minor detail to maintain narrow clarity of the concept regarding its implementation in other countries of the worlds. He explain Kaizen as a Japanese word for CI which means all activities taken place in the Japanese shop floor to enhance the performance and environment of the organization as a uncontract or partially contracted activities of the employees of the organization. The concept of Kaizen

motivates the shop floor workers to contribute in the development of their own organization (Bessant, 2000). The researchers have focused on three main sentiments of Kaizen given as follows:

a. It is a CI process of quality and efficiency enhancement.

b. Kaizen is incremental in nature means small improvement and then standardization of the processes, in contrast to major technological innovation.

c. It is being participative in nature involve workforce of the organization in generating quality improvement ideas and implementation of these ideas in the organization.

As per Lillrank (1995) Kaizen is very much linked but not identical to the concept of TQM and QCC. This concept works between many other concepts related to management such as, knowledge management of (Nonaka, Takeuchi, & Takeuchi, 1995), Balance score card of (Kaplan & Norton, 1996), continues monitoring of wide range of processes (Bond, 1999). de Haan, Yamamoto, and Lovink (2001), explained the importance of Kaizen for the Japanese production system. Taylor (1999), differentiated between the Japanese concept of Kaizen and Western concept of Kaizen blitz in which employees are involved in brain storming session and reengineering by the management. Imai et al., (1997) presented the concept of Kaizen as a global program which include the concept of TQM, JIT and TPM whereas other authors think that Kaizen is a tool or a practice which is not being used by the world (Takeda et al., 1998). Due to the wide variety of interpretations of Kaizen it was not influenced by controlling authorities. This gives a chance to the proponent to pick the best element of other systems and methodologies to define Kaizen.

The most focused and clear definition of Kaizen is formulated by excluding the strategy formulation and design of production system. Definition given by Imai (1986b) explains that "Kaizen is taken as persistent continual activity to achieve identified outcome towards organization goals in the form of small incremental projects, which are beyond the contracted role of the employees of the organization"

The concept of Kaizen is further explained through two axes, the degree to which the processes of Kaizen are organized and the extent to which top management influenced the Kaizen activities. This concept is further elaborated in Figure 2.2.

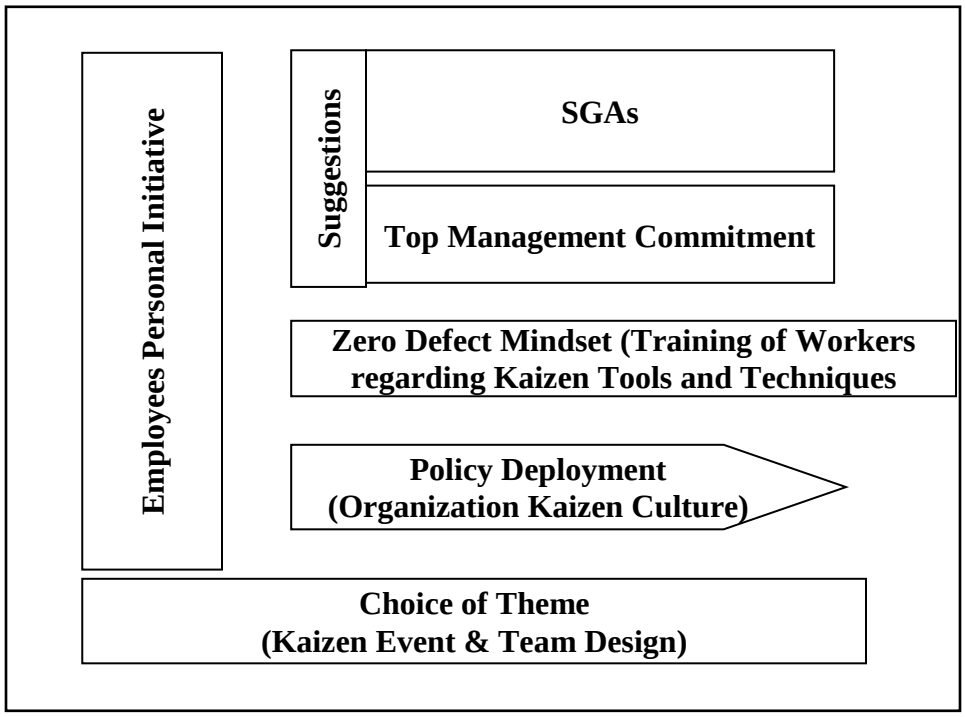


Figure 2.2: Schematic View of Kaizen Concept

Source: (Derived from Imai, 1997)

In Figure 2.2, seven different types of activities which are related to the concept of Kaizen are shown. Details are presented as follows:

a. "Suggestions" means ideas / suggestions floated by the employees of the organization. They may get considered by the organization for evaluation and action. The topic for the suggestions should be relevant to the organizational performance improvement, process or quality of the product improvement or work area of the organization and determine through inspiration of the shop floor workers.

b. Top management commitment means that top management is committed and willing to provide resources, facilitate Kaizen team for effective implement of Kaizen in their organization

c. "ZD" means to change the mindset of the employees of the organization through training of workers regarding Kaizen Philosophy; its tools and techniques; and to improve processes in such a way that actions taken by them will ensure defect free products / services provided.

d. "Policy deployment" means the ways adopted by the management of the organization to promote Kaizen program throughout the organization (Tennant & Roberts, 2001).

e. "Small Group Activities (SGAs)" means precise Kaizen activates performed by the small group of employees of the organization.

f. Activities of these small groups must be supported by the top management of the organization by providing a facilitator and resource needed to these groups working on improvement projects.

g. According to Khan (2007) the aim and objective of Kaizen is to improve functioning of the organization through involvement of the work force of the organization both as a team as well as at individual level. Therefore, for an effective implementation of Kaizen personal initiative of the employees at all level must be there in the organization. Employees must take keen interest in identification and elimination of Mudda.

2.8 **The Importance of Kaizen**

Today the world is known as a global village, as advancement in technology has reduced distances among countries of the world and diffused the spatial boundaries. Due to this borderless world, competition among the industries has increased. Advancement in technology and lifestyle of mankind has turned luxury of yesterday into a necessity of today. Organizations working on traditional ways to produce their products cannot quickly respond to flexible requirements of their customers. Traditional method will not help them survive in this competitive environment. As per Ashmore (2001), 99.9% organizations of the world are working on traditional production system. Under developed countries of the world are under pressure to open up their market for free trade. In order to compete their competitors in the world, the organizations of the under developed countries have to implement CI techniques to enhance quality of their products, processes and services. Thus, there is a requirement for industries of the developing nations to implement CI techniques for the survival of their industries and to adopt

new ways and means of working. The management of the organization using traditional ways of production system has to recognize that their production system is the cause of problem and effective Kaizen implementation is the way to survive in a globally competitive environment. Chris Voss and Kate Blackmon (1998) suggest that Kaizen is one of the effective techniques to improve the company's competitiveness.

In 20th century, the Japanese developed their competitiveness due to successful implementation of Kaizen in their organizations. As per Neely (2005), the most commonly used method to increase competitiveness of the organization is Kaizen or CI. Juran (1987)was of the opinion that the top management should take responsibility to be aware of the positive changes taking place in areas and should take decisions regarding implementation of these positive changes in their own organization. Middle management should make a working plan / system to implement these changes, whereas lower management and work force at the shop floor should carry out the required changes for implementation of the new system. Furthermore, this CI process should continue in a systematic and organized way. It means that organization should adopt method and create environment of CI. Workforce of the organization has important role to play for successful change towards improvement. The simplest, costless and the best way of doing CI is through effective implementation of Kaizen in the organization (Alukal & Manos, 2006).

Kaizen brings workers of the same unit or department together outside the normal work setting, giving them liberty to interact in a more open and relaxed manner. More creative and frank discussions can take place through Kaizen thus leading to suggestions which eventually leads to significant improvements both in quality and performance the organizations business. Industry can survive only by becoming the best in their business. Organizations must be able to compete both in quality and cost with the in competitors. This can only be achieved through building quality in everyone's process and reducing cost by making all our work process more efficient and in built quality process. The person who is working on a job 8 hours a day can best tell us how to do this in the best way and his knowledge can be best utilized through the concept of Kaizen. Thus, Kaizen is a vehicle for industrial survival through which all staff can freely contribute their ideas and work for continuous search for improvement (Awan, Bhatti, & Bukhari, 2007).

Organizations can move towards lean organization through step by step implementation of Kaizen. Through Kaizen, organizations can reduce throughput time, minimize waste, reduce rejection rate, have fewer inventories, have improved work area, enhance quality of the product, improve internal processes of the organization, and increase knowledge & skill level of the employees (Imai et al., 1997). With the application of Kaizen tools, no revolutionary changes in the organization can be achieved; however, these little changes toward improvement indicate a little part of a much bigger picture. The cumulative effect of these small changes through Kaizen can bring dramatic improvement in the organization from strategic point of view. In order to change the bone structure of the organization through Kaizen, long duration is needed. Kaizen is a long term project working in a simple methodology and focusing on common sense of individual workers of the organizations.

The philosophy of Kaizen has to come from top management, and then cascade down to workers. Some Kaizen methods are suitable for Kaizen implementation process in a bottom-up way. These Kaizen tools include suggestion system, 5S, standardization, and waste elimination. For the effective implementation of Kaizen, top management should announce Kaizen as a corporate culture, support and encourage the shop floor workers to set their target in that direction. The managers of the organization should concentrate on the location where actual work is being done and where possible cause of problems can be found. That place is known as Gemba Gembutsu. Gemba means the place of work where task is being done. Gemba is the place where manager should spent his maximum time because this is the place where value is being added, where problems can be identified, analyzed and eliminated (Smalley & Katō, 2010).

Ayse Saka (2004) studied the implementation of Japanese Philosophy Kaizen to Japanese subsidiaries in automotive industry of the UK. She was of the opinion that the implementation status of Kaizen was different in each automotive industry of UK. Operational autonomy given to persons in small-group activities strengthened by a sense of ‘groupism’ in large firms in the Japanese automotive industry.

2.9 **Differences between Kaizen and Innovation**

The existence of Kaizen culture in Japanese manufacturing companies is the cause of their success in the world. In literature Kaizen means “improvement”. In Japanese culture,

Kaizen means company wide, ongoing, incremental changes towards improvement, involving everyone in the organization, whereas innovation means a sudden drastic or a big improvement. It needs a bigger change in the organization, change in technology, process or layout etc. The introduction of CNC machines and CIM system in manufacturing sector organizations is an example of innovation. For good management in manufacturing organization, both Kaizen and innovation are necessary. Although in manufacturing process, Kaizen plays a more important role; however, balance must be maintained between both the concepts. In real scenario, western countries organization are more concerned about innovation whereas Japanese are more interested in Kaizen. The differences between Kaizen and innovation as highlighted by (Khan, Bali, & Wickramasinghe, 2007) are shown in Table 2.4.

Table 2.4: Difference between Innovation and Kaizen

S/No	Kaizen	Innovation
1	Kaizen is gradual and constant incremental changes in process, quality, productivity and performance of the organization.	Innovation is abrupt and volatile change in technology, process, quality, productivity and performance of the organization
2	Kaizen effect is long term and long lasting but undramatic in nature	Innovation effect is Short term but dramatic in nature
3	Kaizen is a small but continual improvements steps	Innovation is a big steps intermittent and non-incremental improvements
4	In Kaizen everyone in the organization is involved in improvement process	Selected few champions are involved in innovation
5	Collective, group efforts and system approach is adopted	In Innovation rugged individualism, individual ideas and efforts approach is adopted
6	In Kaizen maintenance and improvement mode is adopted	In innovation technique scrape and rebuild mode is adopted
7	For Kaizen conventional Know how and state of the art is enough	Technological breakthroughs, new inventions and new theories is necessary
8	Practical requires very little investment but great efforts to maintain it	Require large investment but little efforts to maintain it.

9	Normally Kaizen is a people and process oriented technique Investing in Kaizen means investing on people, not capital	Innovation is a technology and money oriented technique, investing in innovation means investing in technology, equipment, infrastructure not on people.
10	Main purpose is to improve processes, quality of product and improve work area of the organization.	Main objective is to increase profit of the organization
11	Kaizen work well in slow growth economy	Innovation is suitable for fast growth economy.

2.10 **Differences between "Kaizen" and "Kaizen Event"**

The first time Kaizen event-like activity was originated from Toyota (Sheridan, 1997). Study on Kaizen in Japan describes Kaizen events as a "more recent Western development" (Brunet & New, 2003, p. 1428). Thus Brunet and New (2003) study of Kaizen in Japanese corporations clearly distinguishes "Kaizen events" from the older concept of "Kaizen." apparently originating in U.S.A in 1980s (Schroeder & Robinson, 2002). The concept of CI or "Kaizen" is most often recognized as one of the key principles of Japanese manufacturing and, in fact, appears to have been practiced primarily in Japan from the 1950s-1970s, before being reintroduced in USA in 1980s (Jung, 1996).

Imai (1986a) reintroduced the concept of Kaizen into popular, management literature (Sheridan, 1997), defining Kaizen as the principle of continually and incrementally improving all aspects of an organization through the extensive involvement of employees at all levels. At that time Kaizen appeared to be an exclusively Japanese concept (Imai, 1986c; Martin, 2004), cited it as the key ingredient in Japan's manufacturing success. Since Imai's first definition, related interpretations of Kaizen have been proposed. The term, literally translated, means "good change," combining the Japanese words "Kai," meaning change, and "Zen," meaning good. Another popular definition of the concept of Kaizen is "to take apart and put back together in a better way" (Muslea, Minton, & Knoblock, 1998, p. 19).

A "Kaizen event" is related to the concept of Kaizen in several ways. First, both concepts include use of process improvement tools and techniques – often, the same tools and techniques

that are associated with lean manufacturing – to make desired improvements. Second, both concepts include the aim of ultimately producing an organizational culture focused on ongoing improvement (Imai, 1986a; Laraia et al., 1999; Sheridan, 1997). Third, both concepts include the idea of empowering employees to make changes by providing both opportunity to improve work systems, as well as training on the tools and techniques needed to make improvements. Finally, both concepts emphasize making relatively incremental changes to improve performance. For instance, Kaizen events have a relatively narrow focus – focused on improving a specific work area, process or product, rather than making radical change to broader, organizational systems.

In addition, similar to Kaizen, Kaizen events focus on low-cost changes, rather than changes requiring significant capital investment (Sheridan, 1997). Kaizen event can also be used multiple times in a given work area to create cycles of improvement in the work area. The incremental nature of Kaizen is inherent in the definition by (Imai, 1986a). However, as mentioned earlier, Kaizen events are distinct from Kaizen. Kaizen is a broader concept related to an organizational culture that is supportive of CI. As a system, Kaizen has often been implemented through quality circles, problem-solving or continuous process improvement (CPI) teams, employee suggestion programs, and other ongoing policies that enable employees to participate in improving their daily work.

There is some evidence that some organizations have realized benefits through the implementation of these types of CI programs (Chow-Chua & Goh, 2000), although many such programs have also been reported as failed (Easton & Jarrell, 1998; Keating, Oliva, Repenning, Rockart, & Sterman, 1999; Sterman, Repenning, & Kofman, 1997). Quality circles, problem solving and CPI teams, and employee suggestion programs are all long-term initiatives than the typical Kaizen event. For instance, CPI teams generally meet for a few hours at a time over weeks or months (Mohr & Mohr, 1983). Employee suggestion programs and other policies are even long-term. Thus, Kaizen events are clearly distinct from the usual ways in which Kaizen is implemented as a system. However, Kaizen events could be a vehicle to implement the concept of Kaizen within an organization (Kumar & Harms, 2004; LeBlanc, 1999). Kaizen events could be a component in an organization's Kaizen system, used either with more "traditional" systems such as CPI and employee suggestion programs, or by itself. Kaizen events support key concepts related to Kaizen including enabling employees to make changes to their work areas, developing

an organizational culture focused on ongoing improvement, and achieving improvement incrementally.

Kaizen Events appear to offer at least two noticeable potential benefits over the way Kaizen is often implemented in organizations. First, Kaizen events often generate immediate perceivable performance improvements. This immediate return on investment could provide the short-term "wins" many in organizational change literature sources cite as necessary to create employee buy-in (e.g., commitment) to a given improvement program over the longer-term(Keating et al., 1999; Kotter, 1995). Thus, it is possible that organizations that use Kaizen events with, or instead of, longer-cycle "traditional" CPI programs with similar objectives may ultimately be more successful in sustaining their ability to produce improvements.

Second, because Kaizen event teams typically have authority to implement changes during the event without direct approval from senior management(Bicheno, 2001; Laraia et al., 1999; LeBlanc, 1999; Muslea et al., 1998; Oakeson, 1997; Sheridan, 1997), they often have a high degree of autonomy or "sustentative participation" as compared with CPI teams(Cohen & Bailey, 1997). In contrast, "traditional" CPI teams, at least as implemented in Western organizations, often have no authority to implement, they merely recommend changes to senior management(Laraia et al., 1999). This is a form of "consultative participation" (Cohen & Bailey, 1997).

This distinction between Kaizen event teams and "traditional" CPI teams is important, since team effectiveness research has shown that sustentative participation is related to both positive technical performance outcomes (Cohen & Ledford, 1994; Cohen, Ledford, & Spreitzer, 1996) and positive social system outcomes e.g., employee satisfaction (Cohen & Ledford, 1994; Cohen et al., 1996; Seers, Petty, & Cashman, 1995) and commitment (Cohen et al., 1996). Meanwhile, most studies of consultative participation have shown no relationship between consultative participation and these outcomes. One study (Griffin, 1988) did show initial gains in satisfaction for quality circle members, but these gains decreased substantially after 18 months and disappeared completely after three years.

Another study carried out byBatt and Appelbaum (1995), which directly compared consultative and substantive participation for teams in two industries (telecommunications and apparel), found that sustentative participation was a strong predictor of both technical and social

system outcomes, e.g. satisfaction, organizational commitment, and workers' perceptions of quality, while consultative participation was only a weak predictor of organizational commitment for one of the two industries. Since they rely on substitutive participation, rather than consultative participation, Kaizen events have the potential to produce more favorable technical system outcomes and social system outcomes than "traditional" CPI activities with similar focus.

2.11 Benefits of "Kaizen" and "Kaizen Events"

One of the most significance benefits of Kaizen is that it promotes the passitive change. As we all know that change is the hardest thing for an organization to introduce. Mostly, as mangers, we are directed against the change. Change towards betterment is necesssery for the existence of any organization. As it is a famous saying that " if we do not change we won't be here any more"(Farris, 2006). Our Prophet (P.B.U.H) also said " A man cannot survive in the world until and unless his today is better than yesterday". As perManos (2007), Kaizen is a gradual improvement in the organization with the passage of time.

Kaizen is named as quick or fast improvements, like Kaizen event known as Kaizen blitz, or rapid improvement projects. Kaizen in an organization occurs more rapidly than Kaizen blitz. In traditional improvement process, management normally thinks that if they install new production line, their production will double. They need enterprise wide knowledge to solve organizational, functional and routine problems related to process inventories. An organization mostly overlooks the real power of Kaizen concept of improvement. They acknowledge only big and dramatic improvements. Summary of different benefits of Kaizen, Kaizen Events and traditional improvements as given by (Manos, 2007) are tabulated in Table 2.5.

Table 2.5: Difference between Traditional Improvement, Improvement through Kaizen and Kaizen Events

	Traditional Improvements	**Improvements through Kaizen Events**	**Improvements through Kaizen**
1	Dramatic, one-time, Complex, technologically based.	Small fast, simple improvements through three to five days projects.	Kaizen is a small, steady improvement with the passage of time.
2	Top-down approach.	Team based approach.	Can be achieved through Individuals or groups.

3	Usually based on high investment	Require very low investment	Require very low investment
4	More difficult because users/ performer weren't asked their opinion.	Good because employee(s) came up with the ideas	Good because it is built in employee(s) culture they come up with the ideas
5	Meant to revolutionize an organization.	Kaizen Event focused on elimination of waste in the form of non-value added activities.	Kaizen focused on continuously improvement in all sphere of life.

Effective implementation of Kaizen in an organization has several benefits. These benefits may be quantitative or qualitative in nature. The financial managers of the organizations mostly focus on financial benefits of the organization without considering employees feelings, work style and other intangible benefits achieved through implementation of Kaizen. Management can show specific improvements of the organization to the owner through measureable results in the shape of saving in time, efforts and money.

2.11.1 **Qualitative Benefits**

As per Abdulmalek and Rajgopal (2007), the quantitative benefits achieved through Kaizen implementation can be summarized as follows:

a. Currency accumulated.
b. Development of top-down approach in the organization.
c. Time saved (contributing to money saved) by reducing defective products.
d. Shorter distance traveled through layout improvement.
e. Fewer people required to solve the important issues.
f. Reduced lead time or cycle time by eliminating waste.
g. Value vs. non-value added content in the manufacturing processes.
h. Elimination of non-value added activities in the processes.
i. Zero rejection rate through employees' suggestion and involvement.
j. Reduced inventory by taking timely decisions.

2.11.2 **Quantitative Benefits**

According to a case study carried out by Tompkins and McGahan (1999), improvements

achieved through Kaizen implementation along different head in organization are 70-90% in setup time reduction, 20-60% in Productivity improvement, 30-70% in Processing time reduction, 40-90% inventory reduction and 20-30% reduction in walking distance. The researcher is of the opinion that the benefits achieved through Kaizen and Kaizen event are difficult to measure. For example, 5S event's outcome in terms of shorter distance traveled within a workplace can be quantified. It also leads to fewer number of safety related accidents. As per Manos (2007), three specific benefits related to Kaizen implementation which are generally ignored by the management and are different than other improvement methods being used by the organizations, can be highlighted as follows.

2.11.2.1 **Time Saving**

The Kaizen is a proactive technique through which organization carryout improvements in the processes and quality of the product before requirement generate. So, the employees have enough time to complete the Kaizen Event as previously scheduled. Furthermore, all the activities related to Kaizen are performed as per given schedule by management

2.11.2.2 **Documental Proof**

The documentation carried out regarding Kaizen activity permits the management of the organization to track tangible improvements in processes, product quality and work area of the organization. Seeing the results of the Kaizen Event, the organization always feel importance and need of the Kaizen implementation in the organization (Manos 2007).

2.11.2.3 **Teamwork**

Through Kaizen Event, employees of the organization learns how to work as a team. Working as a team brings changes in attitudes of the team members which may not be there when they have worked alone. The cross functional Kaizen team members which have been gathered from different departments of the organization always help each other whenever they need help in next Kaizen Event. This kind of attitude of employees of the organization promote lean culture in the organization.

2. 12 **Differences between Kaizen and TQM**

TQM and Kaizen are interdependent. In the literature, Kaizen has been presented as an important element of TQM. Kaizen is one of the reference points in the Deming's 14 points

regarding TQM (Khan, 2008). Deming's point "improve constantly and forever" infer the need for some sort of continuous improvement methodology such as Kaizen. So this makes Kaizen a subset of TQM.

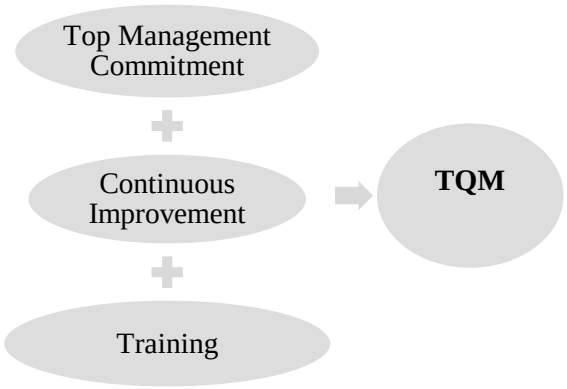


Figure 2.3: Kaizen as a Subset of TQM

Source: Saleem et al., (2011)

Kaizen means continuous process improvement. Some researcher considered continuous processes improvement is a natural evolution of TQM in CI perspective. Both can be distinguishing as Kaizen focuses on small and gradual improvements whereas TQM involves radical improvement of important and crucial processes to get large effects (Davenport & Short, 1990). As per literature review, both concepts are complementary and share the same philosophy (Imai, 1986a). The best organization always applies both the concepts together to get maximum benefits of continuous improvement.

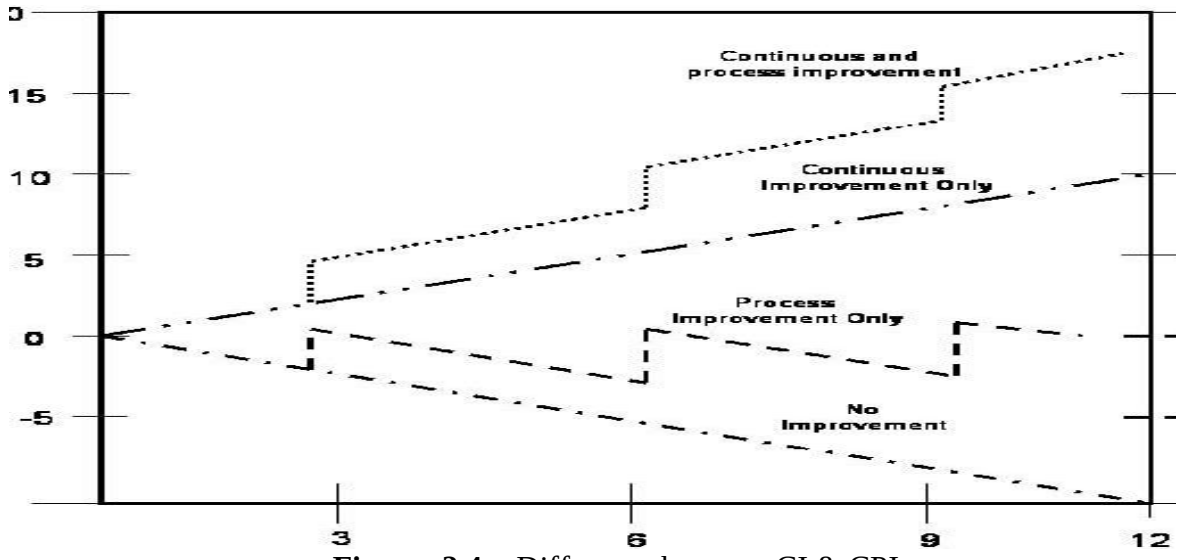


Figure: 2.4: Difference between CI & CPI

Source: Saleem et al., (2011)

Implementation of only one concept will not be so fruitful. The difference between CI and Continuous Process Improvements (CPI) is shown in Figure 2.4. TQM is a philosophy of what makes up a quality organization, and Kaizen is a methodology that one can apply to encourage improvements to existing processes. To get maximum advantages, knowledge of TQM and Kaizen concepts is necessary for the workers, middle management and top management of the organization.

CI of quality should be the concern of every one in an organization. Training should be imparted to every employee regarding how to continuously improve the quality, process and performance of the organization using both the concepts. There should be a brainstorming regarding the problem that occurred in the process, so that the pertinent improvement mechanism should be evolved and implemented. The outcomes of Kaizen activities should be circulated to the whole organization, so that it should work as a motivator for the top management and employees to carry out further improvements through Kaizen. According to Saleem et al., (2011) the main differences between the concepts of Kaizen and TQM can be highlighted under the following headings.

2.12.1 **Definitions**

TQM is a management approach that aims at long-term success by focusing on customer satisfaction, based on the participation of all members of an organization through improvement in quality, processes, services, and the culture in which they work (Khan, 2008). Whereas, the term Kaizen can be defined as "to take apart and put back together in a better way". Kaizen is "small incremental but continual improvement" in order to improve process, quality and performance of the organization.

2.12.2 **Focal Point**

Kaizen is a process oriented approach. It focuses on the improvement of the process to get improved results in every sphere of life. On the other hand, TQM is a product oriented and customer focused approach. It focuses on the quality of the product to satisfy the customer.

2.12.3 **Scope**

Kaizen encourages improvements in the existing processes. The scope of Kaizen is limited to selected project. However, the scope of TQM is spread throughout the organization. It

works on every process at every department of an organization all the time for achieving quality product and services.

2.12.4 **Implementation Method**

Kaizen is implemented in the form of small incremental projects in a selected area to make positive changes in the working standard. These small incremental projects are known as Kaizen events. Kaizen event can be selected for each department of the organization, also for each Kaizen event independent cross functional team is selected which works on the improvement of one project at a time in focus area for a limited time frame. The members of the team work on one process at a time. Consequently, in TQM improvement is to be made on all the processes in all the business department of the organization involving all the persons at a time.

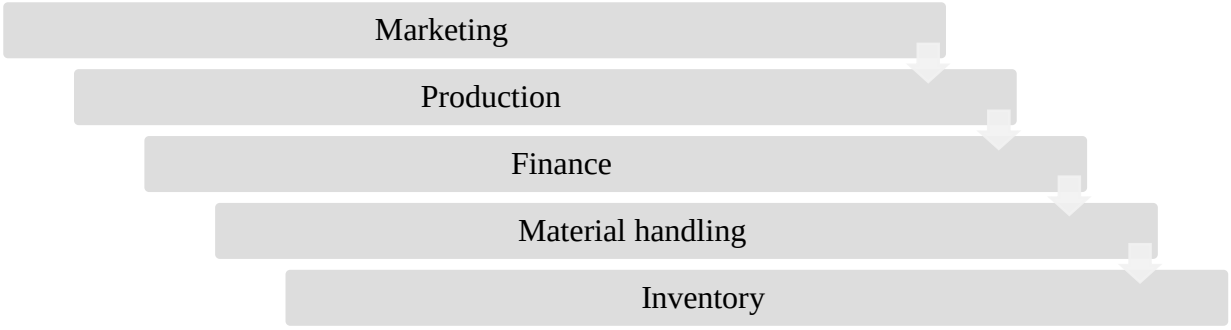


Figure 2.5: Parallel Implementation Method of TQM in Various Department of an Organization

Source: Saleem et al., (2011)

2.12.5 **Implementation Approaches**

Kaizen concept follows bottom-up approach. The suggestions for improvement are put forward by the workers. Whereas TQM concept follows both top-down and bottom up approach, the need for improvement is suggested and introduced by top management as well as by the workers of the organization.

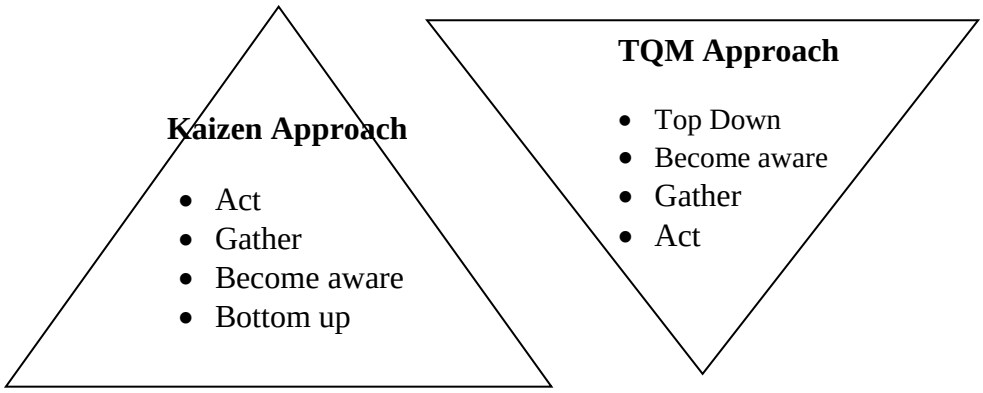


Figure 2.6: The Approaches of TQM and Kaizen

Source: Saleem et al., (2011)

2.12.6 **Importance of Resources**

TQM is more expansive to implement as compared to Kaizen. Kaizen focuses on the improvement of the organization using available resources(Imai, 1986a). It does not encourage large investment for improvement. Whereas, in TQM, investment has to be made for the improvement of the quality of product / process, e.g. investment on purchase of new or updated machinery.

2.12.7 **Involvement of People**

Kaizen involves all stake holders at all level of the organization through asking suggestions for improvements of the organization, but it is not necessary that everyone in an organization should participate in the improvement project. The people linked with a particular process on which improvement project is taking place are involved e g. cross functional Kaizen team. Whereas in TQM, whole organization including all employees at all levels are responsible and involved in improvement of quality of the product at all time.

2.12.8 **Implementation Mechanism**

Kaizen focuses on step by step improvement, while TQM focuses on simultaneous operations in all the processes. In TQM, continuity and improvement of projects goes parallel to each other. Another difference between the two concepts is that, in Total Quality Management there is no discontinuity in the process of continuous improvement, the whole organization should always work on the improvement process. On the other hand, Kaizen focuses on small scale improvements in steps. After every step, their lies a discontinuity for sustaining the

improvement, afterwards the process continues toward the second step and so on. This is called continual improvement.

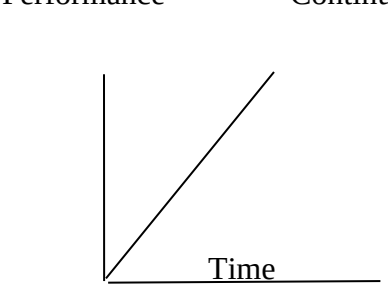


Figure.2.7: Continuous Improvement in TQM

Source: Saleem et al., (2011)

2.12.9 **Improvement Strategy**

Kaizen strategy is made for small permanent improvements in processes. However, TQM focuses on long term improvements. TQM means organized Kaizen activities involving everyone in a company, putting universal and integrated effort toward improving performance of the organization at every level.

2.12.10 **Improvement of Quality**

Kaizen and TQM both deal with the quality. TQM focuses on improving quality by value addition, making the product perfect, improving productivity, reducing the variation in measurements and processes (Khan, 1999) while Kaizen focuses on improving quality through small incremental changes in processes and workplace result in reduction of different types of wastes.

2.12.11 **Improvement through Innovation**

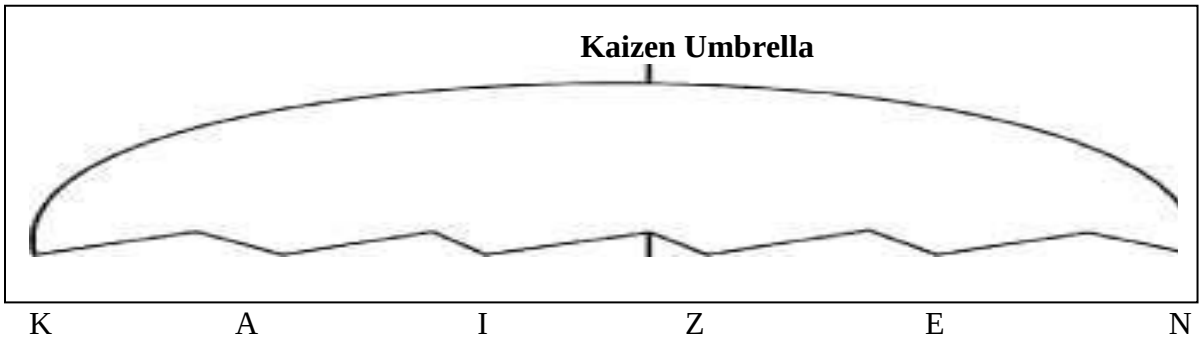
TQM involves continuous improvement of process through Kaizen and innovation, whereas Kaizen philosophy stresses on continual improvements in existing standards rather than innovation. This process leads to better utilization of R & D resources of a company and better productivity.

2.12.12 Decision Making

Quality decisions are made based on measurements in case of TQM. After the decision is implemented, the output is compared with the standards, but in Kaizen, decisions are made when an employee suggests errors in his job; it is not seen as an occasion to blame, but as a chance to find out what went wrong with the process. The continuous improvement by removing the errors and minimizing the chances of reoccurrence is the baseline to make decisions in Kaizen.

2.13 Tools and Techniques under the Umbrella of Kaizen

As perImai (1986c), there are numbers of tools and techniques under the umbrella of Kaizen. The name and detail of these tools and techniques are given as follows.



Kanban, Automation, Improvement, Zero Defects, Effectiveness, Networking, Customer orientation, Just-In-time, Suggestion system, Poka-Yoke, Small group activities, Total Productive Maintenance (TPM), 5S, Single Minute Exchange of Die (SMED), Quality Control Circle (QCC), Work Improvement Team (WIT), Cellular Manufacturing (CM).

Figure.2.8: Tools & Techniques under the Umbrella of Kaizen (Imai, 1986a)

According to Imai (1986a), these tools can be describe as under:-

2.13.1 Kanban

Kanban is a visual signal that is used to trigger an action. The word Kanban is Japanese. Roughly translated “card you can see”. Toyota introduced and refined the use of kanban in a relay system to standardize the flow of parts in their production lines in the 1950s. Kanban was one of several tools Toyota developed to ensure that inventory and was based on actual customer orders rather than managerial forecasts.

2.13.2 **Automation in Technology**

Automation is opposite to human operation or control of a process, equipment or a system; or the techniques and equipment used to achieve this. It is most often applied to computer or electronic control of a manufacturing process.

2.13.3 **Zero Defect**

The concept of ZD means change the mindset of the employees to produce defect free products. The objective of concept of ZD is limited to continuous improvement in product quality; whereas, the objective of QCC is improvement in quality of the product, methodology, motivation level and moral of employees. ZD focuses on as little number of defective item as possible. Theoretically this means there is no defective product.

Zero defects is a laudable objective only where the process' ability to predictably generate output within the specification limits is improved instead of widening the specification limits.

2.13.4 **5 S**

The 5 S philosophy focuses on effective shop floor/workplace management. 5S philosophy simplifies, organizes work environment through eliminating waste and non-value added elements around the shop floor. 5S is a combination of 5 Japanese words; Seiri means cleanliness, Seiton means arrangements, Seiso neatness or Shining, Seiketsu discipline and Shitsuke means in order. It is a companywide self-initiative cleanliness program implemented by Japanese in their organizations. The philosophy behind this tool is working efficiency of employees, quality of work and safety factor in operation to enhance and maintain a clean and well maintained workplace. Before starting of a Kaizen activity it is a better approach to run 5S program in the organization.

In 5S cleanliness means look, item presentation in the selected area (shop floor). It suggests keep them in the area if they needed, otherwise get rid of them as a scrap. Second S, (arrangements) mean what so ever item selected to be kept in the area should be arrange in a proper manner. Third S, means clean all those things present in the work place. Fourth S ask to standardize all the activities / items and the fifth S means, proper system must be established at the work place and people should be rewarded showing good result in 5S.

2.13.5 **Single Minute Exchange of Die (SMED)**

Single Minute Exchange of Dies (SMED) has been developed by Shigeo Shingo in Japan in order to reduce the loss of time, outcome and quality of work due to consumption of extra time in setup and changeover of tools activity.

2.13.6 **Quality Control Circle (QCC)**

Small groups of shop floor worker activities to give solution of minor quality related problems using quality control techniques, (Toyota Production System, 1993, p. 193). Through quality control circle worker's sense of responsibility for the products and process will increase and workforce itself will generate improvement in the organization. It is a management tool for various work environments. It has number of benefits like effective communication, best use of workers capabilities, and improvement in quality of the product and enhanced productivity of the organization (Mandal, Love, Sohal, & Bhadury, 2000).

2.13.7 **Team Work**

As per Wicken (1990) Kaizen is described through the concept of teamwork. In Kaizen emphasis is always given on teamwork, quality and flexibility. Commitment of workers and team work always come from direct communication between workers and their boss. This concept of team work was highlighted by Nissan Motor plant in the UK by giving key role and authority to each supervisor as a team leader.

2.13.8 **Just-In-Time (JIT)**

The concept of JIT can be defined as the flow process in which required parts are available at assembly line whenever they are needed and in which quantity they are needed(Ohno, 1993), p-304. Toyota Company has explained the concept of JIT as to translate each order into a delivery of the finish product as efficiently as possible and name this concept as a pull system (Tompkins & McGahan, 1999, p. 28). The basic principle of JIT is to eliminate all form of Mudda and this concept is successfully implemented where repetitive manufacturing job is being done (Aghazadeh, 2003). As per Petersen (2002), successful implementation of JIT philosophy in an organization results following benefits:

a. Quality improvement of the product
b. Reduced inventory level

c. Improved customer relationship

d. Reduction in turn over state of employees

e. Lead time reduction.

f. Less material handling and storage cost

g. Reduction in setup time

h. Effective use of work place.

2.13.9 **Poka-Yoke**

Poka-Yoke means foolproof design of a system. The principle of Poka-Yoke should include the design of the product / process which ensures that the process is made as fool proof as possible (M Colenso, 2000, p. 32). The concept of Poka-Yoke ensures mistake proofing through finding and correcting faults as near to the source as possible (Fisher, 1999). Generally the outcomes of the Poka-Yoke are improvement in processes of the assembly line. The Poka-Yoke implementation principles can be divided into six parts named as follows:

a. Detection

b. Mitigation

c. Prevention

d. Facilitation

e. Replacement

f. Elimination

2.13.10 **A Work Improvement Team (WIT)**

In order to improve quality of the product, working processes or a system, organization forms WITs. These WITs can have multiple objectives.

2.13.11 **Cellular Manufacturing (CM)**

The philosophy of recognizing and developing similarities among components / parts to be manufactured and grouping them into families having same shapes, production process (Mansouri, Husseini, & Newman, 2000). CM is a process where parts are manufactured as a one item at a time (Mika, 2006). To establish principle of CM mostly Kaizen is used. By using CM techniques production flexibility of the organization increases and setup time reduces

significantly. CM technique increases productivity of the organization due to the working of self-organized group of workers (M Colenso, 2000, p-30).

2.13.12 Total Productive Maintenance (TPM)

The technique used to enhance the life of machinery / equipment and to avoid failure of the equipment through preventive maintenance is known as TPM. The focus of Kaizen on this tool is regarding taking care of equipment instead of rotating workforce of the organization into service engineer (M Colenso, 2000, p-33). As perBamber, Sharp, and Hides (1999), TPM is a manufacturing program primarily designed to enhance the efficiency of the equipment throughout its life by participation of entire workforce in its regular maintenance.

2.13.13 Tact and Cycle Time

Parts produced per line divided by the time needed to produce those parts is known as Tact and Cycle time. Tact and cycle time depends upon following:

a. Quantity of parts ordered by the customer.
b. Numbers of production lines available.
c. Available time for the completion of order given by the customer.

The operating time of workers can be increased more than 90% by adjusting and optimizing above mentioned parameters (Ohno, 1993, p-304). The time required to finish one operational step in the production process is known as cycle time. This cycle time should be minimum or equal to Tact Time.

2.13.14 Pull System

The pull system means first generate requirement from the customers then produce required items to fulfill the needs of the customer. Whereas, in push system product is developed and then it is send to the market and production of a new product waits till the consumption of the previous one. Pull process is opposite of push process in production industry.

2.14 Continuous Improvement Models and Frameworks

Kaizen, the CI can be defined as a planned and organized process of continuing change toward betterment. Review of the literature related to Kaizen implementation framework reveals

that the literature does converge to support some standard paradigm of Kaizen practices. Factors affecting CI and converging ideas in the literature and others based on the study by Deming, (2000), consists of the following:

a. Analyses and understanding the current situations and acquiring sufficient data for selection of improvement activity and setting of objectives for Kaizen team from the suggestions given by the workers
b. Adjustment and implementation of the selected proposals, measure output and productivity.
c. Identification of the root cause is necessary. Root causes are always identified through analysis of the concerned data to establish and implement counter measures
d. Confirm the effects of the countermeasures to check that the measures taken have improved the result up to the desired expectations.
e. Standards are revised and processes are reviewed for future comparison and improvement purpose before implementation (Bond, 1999; Terziovski & Sohal, 2000).
f. Implementation of new processes through necessary modification in the existing process for standardization.
g. Development of a Kaizen culture in the organization (Farris, 2006).
h. Development of Kaizen support structure of the organization (Farris, 2006).
i. The use of Kaizen event design elements like teams and event design (Khazanchi, Lewis, & Boyer, 2007).
j. Involvement and role of training of workforce (LeBlanc, 1999).
k. Management support and buy in (Bradley D. Miller, 2004).
l. Rewards and recognition to employees (Martin & Osterling, 2007).
m. Action orientation Kaizen (Glover et al., 2011).
n. Improvement of target area (Mika, 2006).
o. Focus on waste elimination (Boyer, 2002)

p. Focus on HR development (Newitt, 1996b).

q. Improvement of Quality of the product (Singh & Singh, 2010).

r. Improvement of internal process of the organization (Singh & Singh, 2010).

Based on different factors following existing Kaizen frameworks / models have been analyzed for the development of new research framework of Kaizen:

a. Deming Cycle of Continuous Improvement

b. Toyota Production System

c. Project Success Factor Theory

d. Team Effectiveness Theory

e. Bessant and Caffyn Continuous Improvement Model

f. WU and Chen Integrated Structural Continuous Improvement Model

g. Kaizen Event Effectiveness – Outcome and Critical Success Factors

2.14.1 **Deming Cycle of Continuous Improvement**

Deming (1986), developed PDCA cycle for CI in quality. In this cycle, emphasis was given on management approach to quality. It has a broad new approach of auditing the existing performance and application of corrective measures in schedule management activities. In this cycle the word “P” indicates Plan, “D” indicates Do, “C” indicates Check and “A” indicates Act. In this model, during act focus is given on analysis of outcome and solving the causes of problems identified. However improvement of processes, policies and practices have not been catered for. With the passage of time, different Kaizen tools and techniques have been developed. The managers having significant knowledge, skills and abilities to use these tools will be more successful in an organization to solve the problems whereas managers who are not familiar with CI tools required in PDCA cycle are no more effective to solve the problems of the organization.

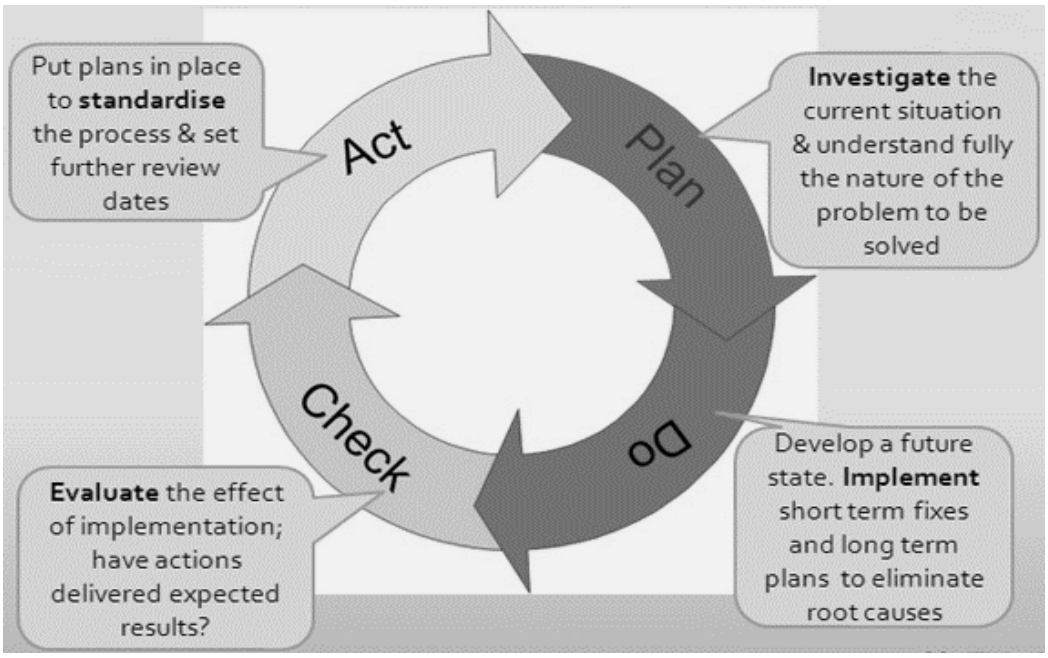


Figure 2.9: Deming P D C A Cycle

Source: (Deming, 1986)

2.14.2 **Toyota Production System (TPS)**

Toyota production system (TPS) has been implemented by many companies of the world. However its tool and philosophy are not yet fully understood and practiced by the organizations outside Japan. Toyota production system describes 14 basics elements which are the foundation of Toyota production system. These elements are broader in nature and organizations must have knowledge of them for successful implementation of TPS (Kaizen). Kaizen is only one element of TPS that is least understood and practiced outside the Toyota Company. Improvements up to 85% in Toyota Company are physiological and based upon visual aspects of Toyota production system. This difference can easily be seen in the organization where Toyota production system is not being implemented. As per Smalley and Katō (2010), steps involved in Kaizen methodology as practiced in TPS can be described in Figure 2.10.

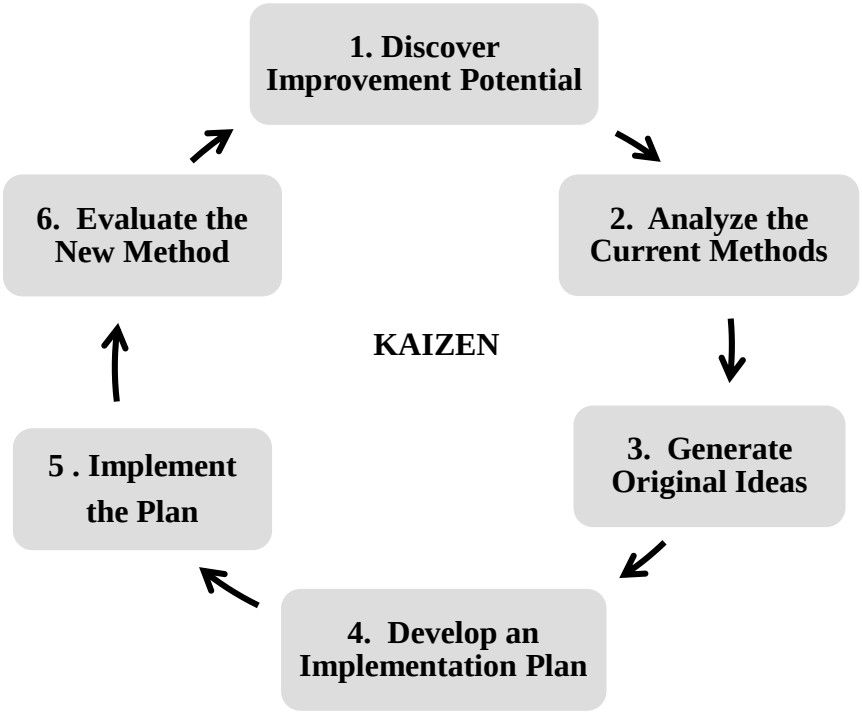


Figure 2.10: Steps Involved in Kaizen Implementation

Source: (Smalley & Katō, 2010)

a. **Discover Improvement Potential:** Discovering improvement potential through employees' suggestions system of Toyota production system.

b. **Analyzed Current Method:** Current methods are analyzed using six basic methods for studying work relating processing.

c. **Generate Original Ideas Regarding Improvement Potential:** Employees of the organization give their ideas regarding finding solution of improvement potential.

d. **Develop Implementation Plan:** Employees of the organization develop implementation plan regarding ideas generated and discuss with the management of the organization for approval of the plan.

e. **Implement the Plan:** After approval from management, employees implement developed plan in steps.

f. **Evolution of New Method:** The results of new measures are compared with the old ones. On the basis of improvement in results, the new method is evaluated thoroughly and then becomes standard procedures.

Toyota production system has been developed on the basis of practical experience and practitioner's knowledge. No empirical study has been carried out on correlation among different elements in Toyota Production system. Secondly, this system is suitable and most effectively implemented in Japanese culture.

2.14.3 **Project Success Factor Theory**

Since its inception as a discipline, a major focus of the project management field has been identifying the critical success factors contributing to project success. Although, research on critical success factors has been ongoing since 1960s (Belassi & Tukel, 1996), there is still a lack of agreement on both the critical success factors and the definition of "project success" (Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002). Many models showing relationship between critical success factors and project outcomes have been proposed. Project management theory can contribute to the study of Kaizen, since Kaizen activities can be described as a short-term improvement project. For instance, (Bane, 2002) described a Kaizen team as a "dedicated project team," while (Handfield & Melnyk, 1998) and (Bradley & Willett, 2004) both describe Kaizen activities as "improvement projects." A Kaizen event also conforms to the project management discipline's definitions. For instance, a project is defined as "a temporary attempt undertaken to create a sole creation or service" (Guide, 2000, p. 4). Kaizen activities in the form of Kaizen event are also temporary in nature with a clearly defined limit of time frame.

A Kaizen event is a onetime, unique endeavor. It seems unlikely that an organization would ever repeat a Kaizen event in exactly the same way in a given work area. Even events with similar focus that are "repeated" within the same targeted work area, process would be expected to have different objectives. Organizational and work area contexts, team compositions and team activities will be different for each Kaizen event. As per Lewis (2000), definition of project can be given as "a one-time, multi-task job that has clearly defined starting and ending dates, a specific scope of work to be performed, a budget, and a specified level of performance to be achieved". Again, a small improvement activity known as Kaizen event clearly falls under this definition as it has following similarity with small nature of project.

a. **Starting and end dates:** Kaizen event has clearly defined starting and ending time frame. Generally the length of the Kaizen event is one week or

shorter(Bicheno, 2001; Bradley & Willett, 2004; Drickhamer, 2004; LeBlanc, 1999; Martin, 2004; McNichols et al., 1999; Smith, 2003; Watson, 2002).

b. **Scope of the Project:** The objectives and boundaries of a given Kaizen event are clearly defined prior to the start of the event (Bicheno, 2001; Gore & Adams, 1997; Handfield & Melnyk, 1998; Lange, Wackett, Minton, & Daly, 1998). Other than that, Kaizen event teams are also instructed not to go beyond the boundaries of their event and use a "Kaizen newspaper" to note potential improvements that are beyond the scope of their event for implementation as a new Kaizen event in future activities (Bradley & Willett, 2004; Handfield & Melnyk, 1998; Martin, 2004; McNichols et al., 1999).

c. **Clearly defined budget:** Event budgets, although generally small (Bicheno, 2001; Kristin N Cuscela, 1998; Gore & Adams, 1997; Martin, 2004; Purdum, Teresko, & Vinas, 2004; Sheridan, 1997; G. S. Vasilash, 1993), are defined in advance of the given Kaizen event and is informed to the Kaizen team members and team leaders.

d. **Clearly defined performance levels:** Clearly specified, measurable goals is one of the key characteristics of Kaizen events (Bradley & Willett, 2004; Handfield & Melnyk,1998; Vasilash, 1993). In addition to noting the ways in which Kaizen events conform to the definition of an organizational project, it is almost important to identify key ways in which Kaizen events are likely to differ from "typical" organizational projects. These differences were kept in mind when reviewing the literature and developing the working theory of Kaizen event research, e.g. factors that relate to the long-term coordination of project activities were omitted from the research.

e. Primary differences include Project timeframe (one week versus several months) and Project scope. As compared to many projects within organizations, Kaizen events have a relatively narrow scope. Scope is generally related to length of the project/ timeframe. However, Kaizen events may have much shorter timeframe, but similar scope as of "traditional" CPI projects. While Kaizen events require

prior planning due to their short time frame and small scope, they do not require as much sophisticated monitoring and control during the project.

Models proposed in the project management literature are reviewed / analyzed with respect to their applicability to the study of Kaizen implementation in the form of Kaizen events. As per Slevin and Pinto (1987), ten key factors contributing to project success were identified and compared with factors related to Kaizen event. The researchers conducted a survey from 52 part-time MBA students working at the University of Pittsburgh. They were asked to imagine themselves in the role of project manager for a project in which they had been involved and then to identify five actions to improve the likelihood of project success. Students were allowed to define "project success" that "resulted in organizational change". Ten success factors selected for the measure of response given along with their parallel consideration in Kaizen event are given as follows:

a. Project mission in the form of goal clarity

b. Top management support

c. Project schedule, soundness and clarity of tactical plan for achieving project objectives

d. Client consultation - in the form of customer's satisfaction and feedback

e. Employees commitment and personal initiatives

f. Technical tasks - adequacy of technical knowledge and equipment for achieving the project mission

g. Client acceptance

h. Monitoring and feedback

i. Communication

j. Trouble shooting

Slevin and Pinto (1987) developed an assessment tool, the Project Implementation Profile (PIP), a 100-item questionnaire intended to allow managers to rate the relative presence of these ten critical success factors. The author conducted additional research on the relationship of the success factors with outcomes for various types of projects. Pinto and Slevin's methods have

many weaknesses, for instance students instead of actual project managers were selected to get response on survey scale items. The only requirement for participation was that students were employed full-time and had been part of at least one project team within their organizations during the two years prior to the study. Other weaknesses include low interrupter agreement on classifications, and lack of rigorous testing for the PIP. However, it represents one of the first attempts to empirically identify project success factors. In addition, their critical success factor list has been mentioned in subsequent studies. According toGherardi and Nicolini (2002), and as well as many other researchers, Kaizen event factors such as top management commitment (Bicheno, 2001; Kristin N Cuscela, 1998; Gore & Adams, 1997; Martin, 2004; Purdum et al., 2004; Sheridan, 1997) rewards and recognitions (Bradley & Willett, 2004) and training of workers (G. S. Vasilash, 1993), Kaizen event and team design (Martin, 2004) are potential success factors.

To develop their model of the relationship between critical success factors and project outcomes, Belassi & Tukel (1996) reviewed previous theoretical and empirical studies on project success factors. They argued that many earlier studies that focused on identifying critical success factors were often either too general or too specific to particular types of projects. Instead of focusing on identifying individual critical success factors, they proposed a model focused on the relationships between four comprehensive types of critical success factors and project outcomes:

a. Factors related to the project, e.g. size, uniqueness, and urgency.

b. Factors related to the project team, i.e. project manager and project team member characteristics.

c. Factors related to the organization, e.g. top management support and availability of resources.

d. Factors related to the external environment, e.g. political, economic, social, technological issues.

In the Belassi and Tukel (1996) model, many variables traditionally thought of as critical success factors such as the availability of resources and the quality of project planning, scheduling and communication are portrayed as intervening “system response” variables that are proposed to mediate the relationship between critical success factors, i.e. organization,

environment, project team or project characteristics and project outcomes. They tested the usefulness of their model by conducting a survey of project managers across a variety of industries, e.g. manufacturing, construction, defense, utilities. Managers were selected from the Project Management Institute directory. A total of 200 survey questionnaires were mailed, and 57 completed surveys were received, showing a response rate of 28%.

The questionnaire consisted of two sections. The first section asked questions about the respondent's industry, typical project size, organizational structure, and the most important success criteria for the respondent's projects. In second section of the questionnaire, the respondents were asked to identify all factors they believed were most important to successful project completion. Factors were grouped according to four categories. They found that the results of their survey were useful for identifying differences in project success factors across industries, project size, organizational structures and success criteria. They also found that factors related to project manager and team member characteristics, as well as the environment and the organization, had an impact on project success that differed by industry, project size, success criteria and organization type.

In contrast, an earlier study by Tukel and Rom (1998), which asked project managers from the same types of industries to identify the most important critical success factors for their projects, produced much less useful information. In previous studies, project managers were presented with a list of five critical success factors from the project management literature, i.e. top management support, client consultation, preliminary estimates, availability of resources, and project managers' performance. They were asked to identify others factors which they felt were important. Study results indicated that organizational factors, e.g. top management support and availability of resources organizational structures, success criteria, and project sizes were the most highly rated factors across all types of industries. Respondents rated project managers' performance as least important to project success.

The authors suggested that their follow-up study, e.g. the one used to test the model, produced more useful information because their model was useful for helping project managers understand the interaction between categories of factors and project outcomes. They also suggested that presenting the factors in a systematic way, by category rather than ungrouped list

helped the project managers to provide more insightful and comprehensive responses about the relationships between critical success factors and project outcomes.

Gherardi, Nicolini, and Yanow (2002), described the relationship between technical factors, social factors as project success. Their main focus was on social factors related to project success for construction industry projects. To develop the model, author paired a "top-down" theory-building approach, e.g. review of related literature streams with a "bottom-up" approach, e.g. focus groups and interviews with construction industry practitioners. In the "top-down" approach, author reviewed relevant work in organizational climate literature, cross-functional new product development team literature, and project management literature to identify technical and social factors that could contribute to successful team member interactions. The authors proposed how these interactions could influence project outcomes. For instance, the cross-functional team literature identifies five categories of factors related to the effectiveness of cross-functional teams (Gherardi et al., 2002) which hypothesized related to construction project success:

a. Task design

b. Group composition

c. Organizational context

d. Internal processes and boundary management

e. Group psychosocial traits

In the "bottom-up" approach, the researcher conducted two focus groups with a total of 17 participants and 7 semi-structured interviews to elicit construction industry practitioner's views. Three broad questions were addressed in both the focus groups and interviews:

a. How do you describe project chemistry?

b. What factors affect project chemistry?

c. How does project chemistry affect project performance?

Interview and focus group data were transcribed verbatim and analyzed using qualitative content analysis procedures. Some construction industry practitioners defined "project chemistry" in terms of team member behaviors, e.g. open communication, collaboration etc.,

while others focused more on team member perceptions of the team environment, e.g. psychological safety, shared focus etc. However, both are clearly related to the outcomes of team member interactions. Similar to the findings from this "top-down" literature review, the researcher found that the construction industry practitioners believed that a variety of technical and social factors affected project chemistry, which in turn was believed to impact project performance, in terms of final product quality, project lead-time and project cost. Five categories of influential factors emerged from the focus group and interview data:

a. **Commercial and Business Practice & Task Design.** This includes methods of establishing a relationship with the client and the quality of the product design process.

b. **Team Selection & Composition.** This includes the team selection procedures i.e. selecting the "right people" in terms of skill mix and personality as well as the extent to which a stable team composition was maintained across one or several projects.

c. **Quality of Leadership.** This includes the effectiveness of the team leader.

d. **Management of Team Development Processes**. This includes the use of team development exercises, role negotiation, and the establishment of metrics related to both technical and social team outcomes.

e. **Initiatives to Sustain Involvement**. This includes communicating results to stake holders throughout the larger and the client organization.

The researcher used the results of both approaches to develop a model describing the proposed relationships between technical and social antecedent variables, team interactions, i.e. "project chemistry" technical and social intermediate project outcomes, and ultimately, "project success". Antecedent variables were divided into the variables that vary at the individual project level, called "Project Level Antecedents", and those that are likely to be "fixed" across all the projects in a given organization, called "Business Environment and Organizational Antecedents". "Project Level Experiences" include team selection, team development processes, quality of leadership etc. "Business Environment and Organizational Experiences" include corporate human resource and the organization's product development process etc. The outcomes of team

member interactions, e.g. “project chemistry” is measured by three dimensions from the Team Climate for Innovation (TCI) model (Anderson & West, 1998; West & Anderson, 1996).

a. Clarity and level of agreement on objectives and vision.

b. Quality and type of interaction.

c. Participative safety and mutual influence.

The selected factor groups relevant to Kaizen implementation and interrelationship suggested by (Belassi & Tukel, 1996; Gherardi & Nicolini, 2002; Slevin & Pinto, 1987) were considered in the selection of specification of the model developed for this research.

2.14.4 **Team Effectiveness Theory**

Cross-functional teams are the human resource structure of Kaizen events (Anderson & Adams, 1997; Kristin N Cuscela, 1998; Demers, 2002; Farris et al., 2009; Handfield & Melnyk, 1998; LeBlanc, 1999; Martin, 2004; McNichols et al., 1999; Rusiniak, 1996; Sheridan, 1997). Thus, team effectiveness theory can contribute to the study of Kaizen by identifying the types of input factors and process factors that may be relevant to the study of Kaizen. The following section provides a brief review of the critical success factors identified in the team effectiveness literature as identified in the comprehensive review provided by (Cohen & Bailey, 1997).

They reviewed research published between January 1990 and April 1996 on relationships between input factors, process factors and team effectiveness for work; parallel project and management teams. The types of teams most relevant to the study of Kaizen are parallel teams and project teams. Parallel teams are cross-functional teams focused on a specific task or problem that regular organizational structures are not well equipped to handle. As traditionally used in organizations, parallel teams often do not have authority to immediately implement changes but instead, only have the power to recommend changes to senior management. “Traditional” CPI teams are often parallel teams. On the other hand, project teams are time-limited, cross-functional teams focused on a one-time product. The output of project teams may be an incremental improvement over an existing design or a radically new design.

In contrast to “traditional” CPI teams, Kaizen events more closely fit the definition of a project team, in that they are clearly time-limited, focused on a one-time product and typically have considerable implementation authority. Based on the trends in team research, they proposed

a heuristic model of team effectiveness which describes interrelationships between key categories of "critical success factors" and team outcomes, e.g. effectiveness. Environmental factors represent broader industry, social, economic and political characteristics over which the organization has no direct control. Meanwhile, design factors are those characteristics of the organization, which are ultimately under management influence. For instance, task design factors include the amount of autonomy given to the team for managing their work processes, as well as the interdependence of team member tasks.

Group design factors include size and demographic profile of the team. Organizational design factors include rewards, training and resources. Group processes describe the interactions between team members, as well as their interactions with external stakeholders. Group psychosocial traits describe group-level characteristics of the team, such as shared beliefs and emotions.

Finally, team effectiveness can be measured through performance outcomes such as the quality of the product/ service provided, attitudinal outcomes (such as employee satisfaction and commitment) and behavioral outcomes (such as turnover and safety measures). The Cohen and Bailey model departs from a strict "input-process-output" approach to understanding team effectiveness.Farris et al., (2009), depicts a direct relationship between design factors, i.e. inputs and team effectiveness, as well as an indirect relationship via group process. Furthermore, group psychosocial traits such as an intermediate outcome of design factors are shown to be both directly and indirectly related to team effectiveness through group process.

2.14.5 **Yusof and Aspinwall (2001) Framework**

There are a very few frameworks of Kaizen being implemented by the companies. Many of them are framed in the academic literature.Yusof and Aspinwall (2001), in their study on TQM implementation framework describe that it is the most complex activity to implement a framework in a company because it involves change in culture and people's behavior. The framework developed by them was based on case study of single organization. No empirical analysis has been done by the researchers. Secondly, it cannot be generalized due to the fact that it consists of case studies of a limited number of organization.

As per Grünberg (2003), a number of methodologies and techniques have been used to improve effectiveness and efficiency of the Kaizen activities in an organization. These

techniques depend upon how these are implemented and the way improvement is achieved. Professionals including Kaizen practitioners mostly confuse the Kaizen requirement (standards) and Kaizen implementation framework (adoption process). Kaizen and TQM requirements are highlighted in different quality award criteria and business excellence model. They normally highlight values that may be considered important for successful implementation of Kaizen. They all provide a checklist of requirement from an organization. These models are developed from assessors' point of view not from the implementer or consultant's point of view that carries out actual deployment in the organization to improve the results.

To develop a suitable and applicable framework for Kaizen implementation, certain characteristics must be considered e.g. simply structured, easily understood clear links between elements that represent a road map for implementation. Most problems in Kaizen related to its implementation and sustainability (Farris et al., 2009; Glover, 2010). Organization thinks that Kaizen is something that can be added to the existing system. CI is recognized as pro-active attitude of the organization. Practitioners normally do not find any standards or methodology for the implementation of Kaizen.

There are some guidelines available regarding interpretation of different framework but not instructing how to implement it. Many case studies also provide certain guidelines for Kaizen implementation. But the detailed requirements for generalization and fitting in an organization are not available. Furthermore, long-term and short-term sequences and details required for implementation have not been provided. Most of the academic literature available is focused on tools and techniques and principles of Kaizen instead of the identification of key elements affecting its implementation process. Bessant and Tsekouras (2001) suggested that it is important to align Kaizen implementation with culture, organizational design and structure, management commitment. Schiffer (2003) emphasizes on technical aspects. He was of the opinion that without management commitment and change in the culture of the organization effective implementation of Kaizen is not possible.

Farris et al., (2009) are of the opinion that the research stream on Kaizen has a limited set of variables, models and methodologies to explain the phenomena of Kaizen. However, in recent past years number of studies on Kaizen concept has expanded to a larger set of authors (Burch, 2008; Marin-Garcia et al., 2009). Furthermore, the study of Kaizen concept appears to be

expanding to a more diverse set of industries, including manufacturing sectors, healthcare, service sector organizations (Adamson & Kwolek, 2008; Mohammad, Mann, Grigg, & Wagner, 2009) and the public sector (Barraza, Smith, & Dahlgaard-Park, 2009; Radnor & Walley, 2008). To continue this advancement of the Kaizen concept future research in this stream is needed which includes more systematic investigations and theory-testing works covering all aspects related to technical, cultural, administrative, managerial as well as training of employees and human resource development through Kaizen. Some of the diverging topics such as the importance of the Kaizen event design and planning process have been studied by Kaizen event researchers (Farris, 2006); still, there is still a limited amount of empirical research in this area. Qualitative research, typically comprising single case study of an organization is the dominant methodology among the Kaizen academic studies. Other than that some quantitative studies have been made (Bateman, 2005; Farris, Van Aken, Doolen, & Worley, 2008).

Operations management researchers emphasize the importance of using both qualitative and quantitative methods in empirical research in order to advance the knowledge and theory of an area of study (Meredith, 1998; Rosenzweig & Roth, 2004). However, the body of knowledge regarding similar phenomena shows that there are still a limited number of methodologies used. For example, while general process improvement sustainability research has included multiple approaches, from the use of multiple case studies (Oxtoby, McGuiness, & Morgan, 2002) to system dynamics (Keating et al., 1999). This may suggest the need to explore more detailed quantitative methodologies in the study of improvement phenomena limited to Kaizen implementation framework development. To check the effectiveness of Kaizen and to get maximum benefits, Kaizen activities should be extended to all the departments of the organization (Jørgensen et al., 2003) and must become a part of the organizational day to day function. Kaizen activities must be of voluntary nature (Lange-Ros & Boer, 2001).

2.14.6 **Besant and Caffyn Model**

The need for the CI framework for performance enhancement was recognized by (Bessant et al., 2001a). The framework given by Bessant et al., (2001b) shows key characteristics of successful implementation that sustain Kaizen activities in an organization. The model shows the basic characteristics which must be developed for Kaizen capability of an organization. Bessant et al. (2001a), from the University of Brighton describe how to form an organization into

a learning organization passing through different stages of CI activities of the organizations. Her model consists of 5 stages for the development of Kaizen capabilities in an organization as shown in Figure 2.11. Detail related different models and framework related to Kaizen implementation available in the literature are given as under:-

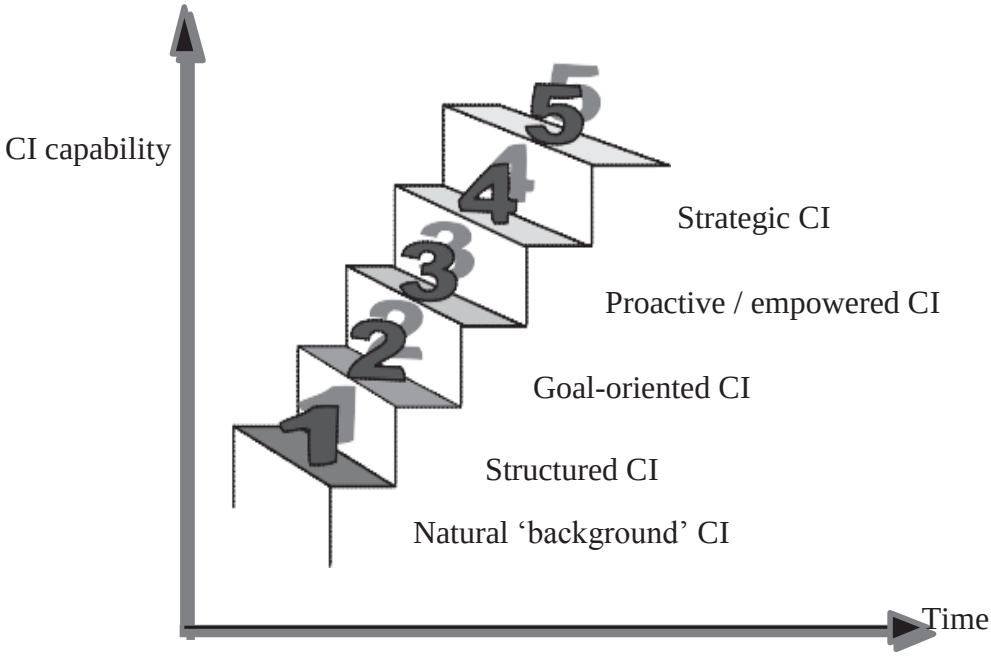


Figure 2.11: CI Maturity Model based on Bessant and Caffyn, (2001)

The basic characteristics and behavior of the models are shown as follows:-

Table 2.6 Basic Characteristics and Behavior Pattern of the Bessant & Caffyn Model 2001.

Development Stages	Characteristics
Level 1 - Preparatory Phase In this phase organizations shows their interest in concept of CI. Management visit to other organizations implementing Kaizen and start attending seminars on CI. Whereas implementation of CI is in its basic stage. Only few Kaizen activities on ad hoc bases started in the organizations	Organization having following characteristics ▪ No tactical collision ▪ Short tenure benefits. ▪ Infrequent burst punctuate by inactivity and non-perception. ▪ No formal efforts or structure. ▪ Dominant form of problem solving is by specialists. ▪ Dilemma of solving haphazard problems.

Level 2 - Structured CI In this phase organization is committed to build CI activities and advance these activities in whole firms. Structured Kaizen activities for continues improvement means formal commitment to build a system for development of Kaizen activities in the organization	Organization having following characteristics ▪ Improvement initiative ▪ Structured problem solving process by staff. ▪ Training of staff in basic Kaizen tools and techniques ▪ Structured suggestion management system ▪ Reward and recognition system
Level 3 - Goal-oriented CI Proper procedure has been established for CI activities and has been linked with the company's broader, global strategy at the local level. Goal oriented Kaizen activity for continues improvement means commitment to linking Kaizen behavior to the strategic concern of organization.	Organization having all characteristics level 2 organization along with following ▪ Having formal deployment of strategic goal. ▪ Monitoring and measuring of continuous improvement against these goals ▪ Focus include cross boundary and cross enterprise solving ▪ Kaizen activities are part of main business.
Level 4 - Proactive CI Employees of the organization have been given autonomy and power to select and manage Kaizen event for CI of the organizations. Proactive Kaizen activities for continues improvement mean to develop autonomy and to in power employees to manage and improve their own processes through Kaizen.	Organization having all characteristics level 3 organization along with following ▪ Continuous improvement responsibilities devolve to problem solving unit ▪ High level of experimentation
Level 5 - Full CI capability All the employees of the organizations are involved in high level CI experimentation in all the sections of the organizations Full scale Kaizen capability means to develop learning organization.	Organization having all characteristics level 4 organization along with following ▪ Extensive learning behavior ▪ Systematic way of finding and solving the problem ▪ Capture and sharing of learning ▪ Atom onus but control experimentation

Source: (Bessant et al., 2001a)

The improvement of firm from one level to the next is noticed when organization get abilities as specified in next level of the models. As per Bessant et al., (2001b), these capabilities of the organization to go to the next level are categorized in the order of priority as under:

a. Understanding continuous improvement
b. Getting the continuous improvement habit
c. Focusing continuous improvement
d. Leading the way
e. Aligning continuous improvement
f. Shared problem-solving
g. Continuous improvement of continuous improvement
h. The learning organization

Bessant (2001)highlighted the impracticality of each step crucial to successful CI activities. The authors have proposed the five-level of evulation from the behavioral point of view and try out the idea through structural, logical, strategic CI, autonomous innovation, and finally it becomes a learning organization. The successful target can be achieved after finialization of these five levels. Bessant et al., (2001b)'s concept of level evolution may encourge a business on its present shape. It helps to remove Drucker's curse. On the other hand, (Bessant et al., 2001)'s behavioral model may not relate business real requirements to operate management.Furthermore, this model described the criteria for the organization's wants to implement Kaizen. It distribute organization implementing Kaizen into 5 different levels and also gave guidelines for measurement of continuous improvement's good practices & design. The results of the study were based on case studies in six different organizations. Work carried out in this research focused on behavior and no influence/ involvement of cultural, management and design elements have been fully incorporated. This study did not give any empirical relationship among different factors affecting effective Kaizen implementation. Nevertheless, this model did possess three limitations as describes by (Wu Chen, 2006). These limitations can be explained as under:

a. A secure framework is required to continue CI activities like Kaizen. It does not explain how successful Kaizen implementation abilities, necessary for an organization, can be achieved to obtain these evolution levels.

b. It does not take into account many activities related to life cycle such as introduction, growth, maturity, and decline of a system.

c. It is worth mentioning here that these results were derived from case-study of six companies only. Therefore, further research is needed to synthesize the enablers and inhibitors described in the literature with each stage of the evolutionary model of CI.

The implementation of Kaizen philosophy of CI and above all its sustainability cannot be realized without enhancing the details of behavioral model (Jørgensen, Boer, & Laugen, 2006). Bessant (2001) model can be further elaborated by undermentioned points:

a. A sound knowledge related to different factors affecting Kaizen activities for CI of an organization is needed for its effective implementation.

b. Kaizen activity involves the allocation of resources and human resource for its effective implementation. Organizations should know about all input factors, process factors and expected outcomes of effective Kaizen implementation.

c. Evolutional level or developing process cannot be realized from behavioral model. Model does not explain, how CI ability within each level developed.

d. Developing stages of CI activities are essential for the firm to kow where they stand and whether they can move to a higher stage with its existing structure.

2.14.7 **WU and Chen Integrated Structural Model of Continious Improvement**

This model was developed by Chih Wei Wu and Chyon Ling Chen in 2006. In this model CI activities throughout the organization have been ensured by the management of the organization. Super system having a pyramid consisting of problem, models and tools, and promotion of CI activities as core elements is presented by the authors. Five different level showing different capability of the organizations to carry out CI actvities have been derived. The model analyzes organization CI activities at each level, find failure status of the organization at each stage and injects it as regenrative input to the organization structure to improve its capability of CI.

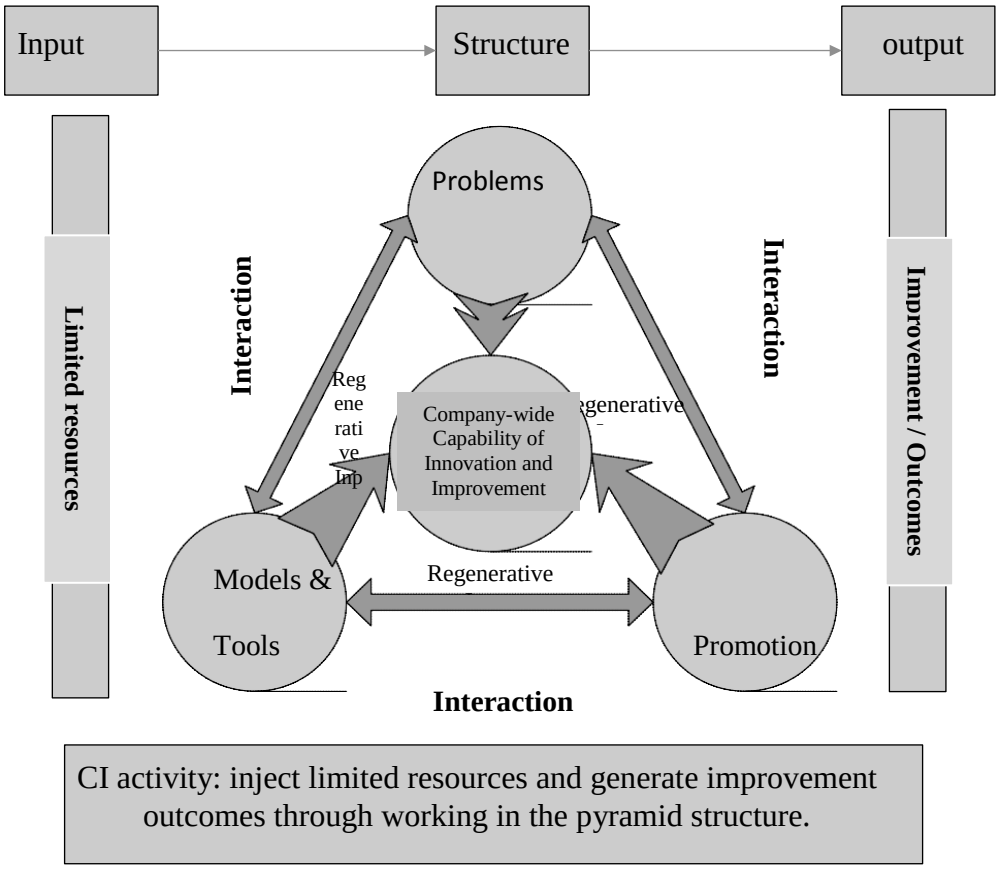


Figure 2.12: WU and Chen Integrated Structural Model for CI (WU and Chen, 2006)

Organizationsnormaly generate their own CI activities to build up an environment for Kaizen. This model basically operates around three elements: problems, models and tools, and promotions. Problems are basically the difference between expectations and reality. The reality is the authentic outcome. If the difference between expection and reality can be physically measured by the organization than the problem is called problem explict. On the other hand, if the difference between expectations and reality is not measureable, the problem is unclear and it is called prospective problem. During daily routine management difference between expection and reality is quite visible, hence problem is easily made out.

The purpose of this model was to provide an efficient and effective problem solving method. Popular models avaiable are the problem-oriented type such as 8D of Ford, DMAIC of Six Sigma and Japanese QC model. The improvement tools that can be applied on those models to solve the problems can be 7QC tools, QFD, FMEA and process flow chart. For the effective

implementation of model it is necessary that not only to continue the CI activities but also to convey them to relevant persons, including employees in the business and the supporting companies. The promotion methods include encourging company wide particpation, building proper improvement models for processing the activities, holding presentation, share improvement outcomes to increase personal initiative of employees of the organizations, providing proper training to employees through educational programme, introducing new techniques, examning the effectivness of the CI activities and linking them to rewards and recognation. The failure of CI activities in the organization takes place owing to inappropriate interaction among problem identification, use of improper models and tools and inappropriate promotion of the CI activities.

Wu and Chen model depends upon three elements: problems identification, use of models & tools and promotion of continuous improvement activities. It does not consider many other organizational (internal & external) variables affecting Kaizen or CI activities. It does not explain the role of top management, systematic evaluation of training of workers. The literature concerning critical success factors of Kaizen attempts to provide guideline for the implementation and sustenance of continuous improvement activities. Moreover, they articulate some of the key elements in achieving and sustaining continuous improvement in the organization. Management commitment, reward and recognition for these CI activities, provision of resources, knowledge captured through training of workers, top-to-bottom deployment of strategic objectives and the need for measurements of the achievement has not been highlighted.

No hierarchies, their function and influential factors of CI have been explained in this model. No emphasis has been given on training of workers. Controlling the training is important for Kaizen activities in the organizations. Organizations may have latest machinery and other technology but if its employees do not have training on this technology then required benefits of continuous improvement cannot be achieved. Many of the organizations failed to progress due to insufficient focus on training of their workers. In order to drive continuous improvement activities, organizations used to give incentives tied to achievement by the workers. Incentives should not only be in the form of money or material but should also benefits as recognitions on the parts of management.

2.14.8 **Kaizen Event Effectiveness - Outcome and Critical Success Factors**

Farris (2006) carried out an empirical investigation of Kaizen events effectiveness and develop a model for socio technical system outcomes and critical success factors of Kaizen event. In this model the factor related to Kaizen event has been correlated. However, the factor related to effective implementation of Kaizen philosophy has not been described. Secondly, in this research sample size of 52 Kaizen events from 6 manufacturing sectors organizations implementing Kaizen was taken. The organizations were also limited to only those geographically located in UK. Therefore, study results cannot be generalized to an organization having different characteristics and located in other parts of the world.

Glover (2010) developed a model for sustaining of Kaizen event outcomes. In this model, factors affecting Kaizen event outcomes have been described. Also empirical relationship among different factors affecting the outcomes of Kaizen event has been established.

The sample size used for this research was only 8 organizations and the respondents selected for this research were Kaizen team members and facilitators only. The researcher has considered input factors related to Kaizen event, Kaizen team design and outcome variables related to Kaizen event goals and objectives. Effect of organizational factors like organization culture, organizational top management commitment, rewards and recognition given to participant of Kaizen and employee related factors such as personal initiative, training of workers have not been investigated by the researcher (Farris, 2006; Glover, 2010). Effect of these factors on outcome of Kaizen need to be empirically analyzed. In this research above mentioned factors have been selected for further empirical analysis and to see their effect on outcomes of Kaizen implementation in automobile sector organizations of Pakistan.

Existing frameworks in the literature were consulted for the development of new specification of the research model. A preliminary global research framework was studied during the pilot phase of the research to understand Kaizen. This broader initiative includes the current research and focused on the study of the sustainability of Kaizen results. As described inFarris, Van Aken, Doolen, and Worley (2004), pilot efforts in this broader research initiative led to the development of specification of a preliminary research framework which describes the types of factors hypothesized related to outcomes and sustainability of outcomes, as well as the relationship of these factors with outcomes to be studied. This framework was specified

primarily using a "bottom-up" approach, i.e. a preliminary investigation of the practitioner literature and direct observation of Kaizen activities during the pilot study and incorporate some of the principal investigators' previous knowledge of team effectiveness and organizational change theory, as well as some preliminary review of the I/O psychology, organizational change and continuous improvement literature.

This global research framework consists of input factors related to an organization such as organizational kaizen culture; management commitment; rewards and recognitions given to participant of Kaizen; employee's personal initiatives; their training on Kaizen tools & techniques; input factors related to the Kaizen event and Kaizen team design. Social system outcomes, HR development, work area improvement and technical system outcomes such as product quality improvement, organizational internal processes improvement and overall success of Kaizen in the form of Kaizen goal achievement are also some of the outcome factors of Kaizen. Organizational factors, employee's related factors and Kaizen event and team design factors are hypothesized to have impact on Kaizen outcomes directly. In addition, there were proposed, intervening of process variables between input variables such as organizational factors, organizational employees related factors and Kaizen event and team design factors and overall success of Kaizen in an organization as a result of effective implementation of Kaizen.

The model developed in the current research represents relationship between Kaizen input factors and outcome variables by specifying the set of input and process factors expected to impact on set of outcome variables of Kaizen. However, the preliminary research framework provide an additional framework for specifying the model for the current research, by identifying three types of input factors such as organization related factors, employees management factors and Kaizen event & team design factors which may be correlated to both social and technical system outcomes of Kaizen.

In addition to the "top-down" approach used to identify potential input and process factors from project management and team effectiveness theory, the researcher also used a "bottom-up" approach to analyze the Kaizen literature to identify input and process factors potentially related to Kaizen implementation. The main purpose of this review was to summarize the Kaizen input and process factors mentioned in the Kaizen literature by describing their contributing to Kaizen.

The literatures on effective implementation of Kaizen indicate that Kaizen effectiveness is a function of independent (input) variables, dependent (outcome) variables and control (process) variables. The research model structure was based on project management and team effectiveness theory. (Cohen & Bailey, 1997). Different independent, dependent and process variables were measured. Both objective and perceptual data was gathered from 54 different organizations including multinational firms; they were selected from the list of organizations implementing Kaizen in different forms as identified from the initial survey of automobile sectors organization of Pakistan. Kaizen effectiveness means to enhance the outcome variables of the Kaizen.

2.15 Key Factors for Development of Research Framework of Kaizen

According to Stefan Stern (2006), Kaizen is the most effective product quality enhancement tool through organizational internal process improvement. Process may be of service provider or of a manufacturing sector organization. As the demand for quality by the customer is continuously increasing, the popularity of Kaizen in organizations strategic set up is going to be increase. Nowadays, the major concern of the manager is how to implement quality tools and techniques in their organizations. Due to unavailability of simple and implementable framework of Kaizen and other quality tools and techniques, mangers discard the Kaizen program, just at the start of it or anywhere after its implementation. They could not foresee the long-term benefits in the form of outcome of a sustained Kaizen program.

As per Hua, Chin, Sun, and Xu (2000), Chinese companies used widespread CI programs such as Kaizen, TQM, ISO 9000 but all of them could not achieve desired outcome. There is a significant impact of different factors related to organization, employees, and Kaizen event and team design on outcome of continuous improvement program. It is a challenge for the organization to implement Kaizen in their setups (Imai, 1986a). To understand the reasons for discontinuation of CI program and not getting its benefits, literature has been investigated. Cheng, Liu, and Logan (2006) studied the influencing factors of CI. The authors have utilized global continuous innovation network data of 2003. Their analysis was regarding the influence of external environmental factors and motive factors of CI activities on its popularization in an organization. Structural equation models (SEM) was used to analyze the influence of these factors on CI program.

Rush, Bessant, and Hobday (2007) identified efficiency barriers in public sector automotive manufacturing industry. They studied the relationship between management and employees for the CI activities in the organizations through a detailed survey of three major manufacturing plants in Pakistan. The barriers identified by them were technology based CI barriers, techniques based CI barriers, employee based CI barriers and waste based CI barriers.

Evidence suggests that Kaizen implementation is becoming more popular (Bane, 2002; Handfield & Melnyk, 1998). However, despite their popularity and organizational potential, there is absence of systematic research on factors affecting the effectiveness of Kaizen program in Pakistan (Malik et al., 2007). The current knowledge about success of Kaizen is entirely practitioner-focused. However, few articles focusing primarily on describing and defining Kaizen, rather than building theories to explain Kaizen effectiveness do exist. The current knowledge is based on unpredictable results from the companies that have implemented Kaizen (Kristin N Cuscela, 1998; Sheridan, 1997) and unproven designs are suggested by individuals and organizations that only facilitate the Kaizen (Vitalo, Butz, & Vitalo, 2003) rather than finding an efficient theory based on understanding of Kaizen.

The latest research on Kaizen event effectiveness by (Farris et al., 2009)also considered a limited numbers of factors especially derived from large industries of developed countries. These factors do not cover requirements of developing countries, e g organizational culture, training level of the worker, management commitment and special issues related to the developing countries like Pakistan. There is no empirically tested and systematic Kaizen implementation design available for the gain of socio technical system outcomes of Kaizen in a most efficient way for automobile sectors of developing countries. There is a dire need to study different factors affecting implementation of Kaizen in developing countries like Pakistan and develop a framework for its effective implementation. Due to the large number of potential factors in Kaizen literature, as well as project management and team effectiveness theory, it was necessary to identify a smaller set of key variables for this research study. A major goal of this refining process was to identify at least one factor related to each of the relevant factor groups identified in the review of the literature.

Following paragraphs provide detail on Kaizen input and process factors and outcome variables of Kaizen. Justification for measuring both technical system and social system

outcomes of Kaizen are provided in the Kaizen literature and team effectiveness theory. Technical system measures chosen for study represent both quality improvement and internal process Improvement. The social system measures chosen for this study include HR development and work area improvement aligned with continuous improvement activities. These variables were chosen to reflect some of the major human resource benefits cited in the Kaizen practitioner literature. The Kaizen Implementation Framework (KIF) is an established framework from the I/O psychology literature (Muchinsky, 2000).

2.16 **Input Factors of Kaizen**

The list of different factors selected as input or independent variables of Kaizen as identified through literature review and survey of organization implementing Kaizen and selected for this research are summarized as follows:

a. Top management commitment (TMC)
b. Organization Kaizen culture (OKC)
c. Personal initiative (PI) of employees of the organization
d. Rewards & recognition (RR) given to the employees on their achievement
e. Training of workers (TOW) of the organization on Kaizen tools and techniques
f. Kaizen event and team design (KETD)

2.16.1 **Top Management Commitment (TMC)**

Organizational top management commits time and resources in the planning and design of a CI system and its execution. Kaizen implementation is only possible when top management is committed to bring improvement in process and deliver quality products to the customers. Process management will liberate the thinking of management at all levels and will provide the climate in which creativity and value addition can flourish (Newitt, 1996a). Management has two major functions; maintenance and improvement (Slaughter, 1998), Management procedure and system; both are significant predictors (J. Li, 2011).

The management has four types of role to play which can be specified as apathetic, spectating and supportive (Birchall, Chanaron, & Soderquist, 1996). Apathetic managers are those who allow workers to make continuous improvement on the shop floor but they themselves pay no or little attention to the progress of continuous improvement. Company CI program is

viewed as workers responsibility and the management seems to grade CI as annoyance rather than a help. Management is of the opinion that they are doing well financially, they do not need any change. In such type of organizations, CI activities are an uphill task that the worker has to perform after getting approval from management. Much of their energy and time is spent on getting feedback from management. Many delays in continuous improvement of the organization are observed in such type of management.

In the second type of role of management that is spectating, management is interested in CI but did not get them involved in the process. Team members get blessings from the top management for implementation of Kaizen activates but have to implement them by themselves. Management see the results / progress and do not take personal interest in continuous improvement activities as they are not aware about what is going on shop floor regarding continuous improvement of the process and performance of their organization (Garcia-Sabater & Marin-Garcia, 2009).

The third type of role of top management is known as task mastering. In such type of management, top management assigns specially design project of CI to its special group of workers to work on. They support their workers and want to be involved but actually they cannot impose the process on their workers. Hence the entire CI project cannot achieve desired results and is unable to become standard work process. People work on the project without enthusiasm and thus the progress made is not worth mentioning. The forth management role is of supportive one. In this type of role, top management is personally interested in the success of continuous improvement program (CPI). They play supportive role instead of starring role. Manager plays a central role in the shop floor for the success of CIP. This type of management role is most desirable for the implementation of Kaizen as CI program in the organization. As per Bessant et al. (1994), for the effective implementation of Kaizen as CI program in the organization, top management commitment and involvement is the key element.

2.16.2 **Organizational Kaizen Culture (OKC)**

Culture can be defined as the "collective programming of the mind"(Hofstede, 2001). Culture is an explanatory variable which can be defined as combination of common views which consists of practices, expressive symbols, values, beliefs and underline assumptions that members of the organizations share about appropriate behavior (Detert, Schroeder, & Mauriel,

2000). Organizations can be distinguished from one another on the basis of culture (Sathe, 1985). There are two major aspects of culture discussed in the literature, one is type of values and behavior shown by the employees of the organizations and the second one is the strength or intensity of those behaviors rooted among employees of the organization. To achieve high level performance from the employees of the organizations both power and substance of culture are essential (Kotter & Heskett, 1992). As per Martin (2004) an organization culture always contributes in CI. The organization where workers and management feel less resistance to change, there is always high level of CI (Dale, Boaden, Wilcox, & McQuater, 1997). Kaizen culture allows the company to flourish CI activities linked to Kaizen implementation and avoid "fire-fighting," that is mostly found in usual operations management (Rich & Bateman, 2003). For the competitive performance of the organization, the manager should always understand the specific requirement of organizational culture (Lin, Li, & Kiang, 2009). The cultural elements tend to be most strongly coupled with elevated performance of the organization in their selected areas (Dale & Cooper, 1992; Garcia-Sabater, Marin-Garcia, & Perello-Marin, 2012; Gunasekaran, Putnik, Saad, & Patel, 2006). As time passed, culture began to receive more attention in quality management (Chan & Quazi, 2002; Masood, Aslam, & Rizwan, 2014). This transfer of importance was motivated by the fact that many Kaizen implementations had created mixed results (Samson & Terziovski, 1999).

The CI is linked with culture of the organization (Gunasekaran, Putnik, Saad, et al., 2006). At the firm level, organizational culture is established as a key determinant of CI activities (Laforet & Tann, 2006; Van der Panne, Van Beers, & Kleinknecht, 2003). Literature on organizational culture shows unification in defining types of culture that support CI. The role of organizational culture is just like a driver in organizational performance (Detert et al., 2000).

In traditional culture of Pakistani organizations, there is an element of mistrust and hostility between managers and employees of the organizations. In a small and medium scale traditional organization, Kaizen was a matter of conflict between operators and managers. To achieve an objective of CI in all aspects of an organization, a Kaizen culture has to be developed where quality must become a common objective of everyone in the organization. Organizations like KSB Pumps, Tetra Pak, Unilever Hino Pak, Indus Motor and Packages are the best examples in Pakistani where Kaizen culture exists.

Culture has been identified as an important variable affecting Kaizen implementation process (Fukuda, 1988; Kono, 1982; Ouchi & Jaeger, 1978). Lillrank (1995) indicated that direct transfers of Japanese management practices like Kaizen fail due to the mental distance, i.e. culture, history and intentional paradigms. Implementation of Kaizen activities in overseas organizations is placed in the cultural and social contexts" (Aoki, 2008). As per Recht & Wilderom (1998), the transferability of Kaizen is influenced by cultural characteristics. For Kaizen to be successful in the organization, it is important that such organizational culture exists where operators can admit their mistakes (Imai, 1986c; Ōno, 1988). It is important to identify relationship of Kaizen culture and other potentially influential factors of Kaizen implementation in the organizations with its outcome variables of Kaizen. Toyota culture can provide insights for a suitable corporate culture for Kaizen (Bessant et al., 2001a). Toyota attaches significance of workers' loyalty to their companies and cultivates a sense of togetherness among their workers (Bessant, 1998). Common trust amid employees willingness to interchange or apply their knowledge and responsibilities without restrictions (Recht & Wilderom, 1998). The philosophy of Kaizen requires employees to identify / diagnose quality problems and take corrective action without going through the management hierarchy (Wakamatsu, 2007). Teamwork and mutual trust among workers are critical for the development of Kaizen culture. Deming (2000) says "Harm comes from internal competition, disagreement and from the fear that is generated".

2.16.3 **Personal Initiatives (PI)**

Behavioral pattern of an individual to take active self-starting approach to perform tasks beyond his contracted role is known as personal initiative (Farris, 2006). Generally, the action performed by individual in personal initiative includes identifying improvement opportunities, breaking of status quo and creating environment favorable to find the solution of the problems. Numerous methods of taking personal-initiative were discussed (Farris, 2006) in the literature. Major issue with personal initiative is finding out the method to measure self-initiative. Measuring of self-initiative through survey is insufficient and lead to improper assumptions. Three measures for personal-initiative were implemented by (Farris, et al., 1996). These are overpowering obstacles, energetic and inventiveness at work. Overpowering obstacles are measured over and done with questioning respondents and challenging them with four tough conditions. For each condition consequent obstacles are presented. Generally, a score ranging

from 0-5 is assigned on that how many obstacles were overwhelmed. Overwhelming obstacles information is related to activeness measure. Employees' dedication to their work and organization is the significant factor in implementing and introducing Kaizen. Because when employees will be dedicated, only then they would able to find out the problems within the system for improvement. Farris & Fay (2000) measured personal initiative by asking managers about their perception regarding the level of personal initiative of employees at the shop floor. This measure was added because it was anticipated that the number of team leader and team members in the study would be limited. The managers were expected to have a good sense of how much personal initiative exists in general at their organizations.

Farris (2006) has characterized the personal initiative into five components which includes

a. Alignment of PI with the organizational goals and objectives
b. Personal initiative should remain there for long-term
c. Personal initiative should be action-oriented
d. Should remain continue in the presence of obstacles
e. Self-initiative and practical in nature

There is similarity in many of the characteristics of Kaizen and personal initiative as both the concepts include activities that are beyond the contracted role of the employee. Both concept involve determination in identifying and solving problems inconsistent with the organizational goal and objectives. It can therefore be argued that the measurement of Kaizen can potentially be accomplished by measuring personal initiative. The concept of personal initiative has already been operationalized and measured. Therefore to contribute towards implementation of Kaizen, a hypothesis was stated: Employees' personal initiative at work is positively associated with successful implementation of Kaizen.

Personal Initiative is one of the most consistently commented on variables of Kaizen (Jørgensen et al., 2003). For the effective implementation of Kaizen, workers must be a part of the improvement process. They offer improvement ideas, proposals and converts these ideas into improvements practices (Jørgensen et al., 2003). Few researchers have different opinions on this (Dale et al., 1997). The researcher is of the opinion that involvement of workers in process improvement can cause workers to have doubts about their job security. On the other hand some

researchers contend that the employees involved in continuous improvement are trained and more skilled than other colleagues. Most of the firms give value to the employees, acquired skills(Bateman, 2005; Rich & Bateman, 2003). Shop floor workers instead of feeling fear of losing their jobs have more chances to get good offers from organizations. For sustained Kaizen activities over a long duration, these activities should be measured as part of the daily routine work, (Marin-Garcia, Garcia-Sabater, Miralles, & Villalobos, 2008).

2.16.4 **Reward & Recognition (RR)**

The culture of reward & recognition of an organization can affect the Kaizen activities in a way that cooperative culture and team work can bring synergy in all types of activities. If the culture, people and system is supportive and encourages improvement activities in the organization as a whole then the successful implementation of Kaizen would be possible (García, Maldonado, Alvarado, & Rivera, 2013). Management should link the rewards and recognition to employee's commitment to Kaizen for improvement of quality of the products / service. Deming, (2014) is of the opinion that merit-based award is not good for quality improvement of the products. Ability of employees to find creative solution to quality problems does not flourish in an organization based on rewards and recognition. Public and management recognition has more value than economic incentive offered to employees of the organizations. Congratulating the employees when they deserve it is also a part of rewards and recognition. The Japanese organization provides rewards to their Kaizen team members and shop floor workers, but they are of a symbolic nature (Recht & Wilderom, 1998).

2.16.5 **Training of Workers (TOW)**

Training of employees is considered a part of the Kaizen implementation process and it affects their ability to execute quality improvement activities. For the effective participation of employees in Kaizen activities, their training and incentives is necessary (Soltero, 2004). Employees training should be of practical nature and specific to their job. Employees must be trained and educated on all new management philosophies tools and techniques such as problem solving techniques, team building and empowerment techniques statistical process and quality control techniques for planning and implementation of Kaizen in the organizations (Robinson & Schroeder, 1993). Based on the practitioner knowledge and the pilot research study, it seems that all organizations provide training to new members of the Kaizen team. However, this training

may be provided “off line” if other members of the Kaizen team have previously participated in similar training activities (McNichols et al., 1999). Whether the training occurs as part of the Kaizen event or through some other means, the length of training, topics covered and perceived effectiveness of training have effect on effective implementation of Kaizen in organizations. In this research, contextual information on training length, whether training was conducted as a formal or informal way and general approach to training on Kaizen philosophy were collected through survey questionnaire which describes the organizations overall approach to conduct Kaizen activities. The current research classified training as an organizational and work area antecedent, since it is a predecessor to event problem-solving activities (Farris, 2006). Using 5S techniques and team training through Kaizen implementation (Lee, 2000). Activities directed towards maintained technology, standards and holding such standards through training and discipline (Slaughter, 1998). As per (Rich & Bateman, 2003), lack of training of worker is a barrier to CI activities in the organizations. Lack of problem solving skills and low quality management practices are the key elements of unsustainable CI activities (Dale et al., 1997).

2.16.6 **Kaizen Event and Team Design (KETD)**

The size of problem and the composition of team to solve the problem are two most important elements which affect Kaizen. The larger the intensity and size of the problem, less are the chances of success of Kaizen. Process management will liberate the thinking of employees at all levels and will provide the climate in which creativity and value addition can flourish (Newitt, 1996a). Some of the proponents are of the opinion that there are five pre-requisite and six different steps necessary for effective implementation of Kaizen in the organization. The most important factor that effect Kaizen is the competency of the Kaizen team. The more competent the Kaizen team, the more are the chances of success of Kaizen. Kaizen event and team design play the key role in its success in an organization(Wickens, 1996).

Actually Kaizen is a philosophy of changing the way of thinking of employees of the organization instead of just change in process of the organizations (Manos, 2007). To make the Kaizen program successful in the organization, the first Kaizen event must be successful (Dale et al., 1997). It means that the first Kaizen action must be a focused improvement activity, where the organizational management set objectives and assign it to competent and cross functional Kaizen team of workers. The concentration of the administration and management staff must be

guaranteed to Kaizen team for all the critical process improvement of the organization (Kaye &Anderson, 1999; Upton, 1996). Most of the researchers are of the opinion that setting objectives and goals for Kaizen team is the key element for effective CI program (Dale et al., 1997). Establishing objectives in the form of Kaizen event & team design remain closely related to the success of Kaizen activities in the organizations (Kaye & Anderson, 1999). Kaizen goal should be based on some reliable measures and must be clearly defined, aligned with the strategy of the organization and agreed to Kaizen team leaders team members (Sundar, Balaji, & Kumar, 2014).

For the effective implementation of Kaizen, establishment of cross functional team of workers from different department is more common (Lawler & Yoon, 1996). Kaizen team might be semi-autonomous and must be facilitated by the supervisory level staff and management of the organization (Lawler & Yoon, 1996; J.A. Marin-Garcia et al., 2008). The leader or coordinator of the cross-functional team should be selected based on his knowledge of the processes and tools and techniques necessary for solution of the assigned problem (Bessant et al., 1994). Kaizen team should be homogeneous, means having members from all the departments. More members should be from production, maintenance and quality department of the organization. With the formulation of cross-functional team, the implementation process becomes more manageable. Similar cross-functional teams are formulated for each department throughout the organization. Heterogeneous Kaizen team feels difficulties in achieving their goals. Kaizen team should meet regularly till the completion of project or assigned task.

In certain cases Kaizen's goals are selected by the team himself or by the team leader and management accept them, whereas sometime Kaizen goals are assigned by the management to Kaizen team, but in any case they must be aligned with organization strategy of CI. Kaizen team must clear that CI process should remain quite complex. Each manager should communicate these goals to each Kaizen team member so that they can help each other to achieve their objective.

2.17 **Kaizen Implementation Process Factors**

The list of different factors are selected for a process variables affecting Kaizen implementation in an organization as identified through literature review and survey of organizations implementing Kaizen and selected for this research are shown as follows.

a. Employee's commitment to Kaizen (ECK)

b. Action oriented Kaizen (AOK)

c. Employees' knowledge about Kaizen tools and techniques (EKTT)

d. Standardization of organizational internal process (SOIP)

2.17.1 **Action-Oriented Kaizen (AOK)**

Action-oriented Kaizen is a discriminating factor between Kaizen and a traditional CPI. It reflects coordination made by the team to manage the time for the solution of problem. According to team effectiveness theory, action-oriented Kaizen have an important role in the outcome of effective Kaizen implementation (Farris et al., 2009). During action-oriented process Kaizen team receives first hand observations related to the selected problem area (David, 2000; Smith, 2003: Clark, 2004). In an action-orientated Kaizen, the Kaizen team keeps production line running which remains helpful for the team to collect real time data for the solution of the problem (Sabatini, 2000; Kumar and Harms, 2004). Due to the cycles of solution refinement during Kaizen activities, the results are of improved standards (Bicheno, 2001; Bradly & Willet, 2004; Clark 2004).

2.17.2 **Employee Commitment to Kaizen (ECK)**

Effective quality improvement program in the organization is associated with employee's meaningful participation. Tasking of employees for improvement of quality of the products without their motivation and preparation will discourage & burden them. They will be deficient of management support. A mechanistic structure leads to a different approach to business compared to the organic structure. For example, when a problem occurs in an organic organization there is no specific individual who covers it because of the vague job descriptions. Consequently, several people who are affected by the problem will share information to tackle the problem together. In contrast, in a mechanistic organization, responsibility is more clearly defined. If a problem occurs in an area where responsibility is not (yet) defined, then people discuss and decide who should be responsible. In mechanistic organization structures it is therefore more difficult for employees to go beyond their job responsibility.

2.17.3 **Expertise on Kaizen Tool & Techniques (EKTT)**

Productivity of the organization increases through application of Kaizen tools and techniques (Erlandson, Noblett, & Phelps, 1998). Using 5S techniques and training of employees on Kaizen tool and techniques will enhance efficiency of the organization (Lee, 2000). Effective implementation of Kaizen tools ensure better and advanced quality of product (Malik & YeZhuang, 2006) and CI in performance of the organization (Adams, Componation, Czarnecki, & Schroer, 1999). "Kaizen is tool of on job performance enhancement of an individual" (Erlandson et al., 1998). Kaizen means improvement that supported by tools and techniques. (Bessant et al., 1994). Kaizen technique aims at increasing profit. (Ashmore, 2001). Kaizen technique is the performance indicator (Ahmed et al., 2005). Kaizen technique is also used to solve the problem (Chandrasekaran, Kannan, & Pandiaraj, 2008). All the firms that had progressed in Kaizen implementation and its sustainability were following the combination of the classic Kaizen tools. These firms integrate and use these tools for the solutions of problems related to quality of their products and arrive at consensus where everyone achieves them in the same way (Chuen, et al. 2006).

2.17.4 **Standardizations of Organizational Internal Process (SOIP)**

The good thing about the Kaizen program is that it helps organizations to define and standardize their procedures (Imai, 1986). Workers have to follow them. The Kaizen program forces shop floor workers to identify the problems and pursue their solutions. It ensures that the solution of the problems has been implemented and standardized throughout the organization (Singh & Singh, 2010).

2.18 **Outcomes Variables of Effective Kaizen Implementation**

Different Factors selected as outcome variables of effective implementation of Kaizen in an organization identified through literature review and included in this research study can be given as under:-

a. Human resource development (HRD)
b. Work area improvement (WAI)
c. Product quality improvement (PQI)
d. Organization internal process improvement (OIPI)

e. Overall Success of Kaizen (SOK) in an organization (goal achievement)

Moran and Aver Gun (1997), believe that the capability to measure results of Kaizen implementation is the key to successful and reliable change. The accurate implementation of a system of metrics and learning from the results obtained are significant elements (Glover, Farris, & Van Aken, 2014). Outcomes of Kaizen are basically impact of Kaizen program implemented by the organization (Doolen, Worley, Van Aken, & Farris, 2003). As per Farris, (2006) the different outcomes of an effective implementation of Kaizen in an organization can be categorized into three different headings:

a. Technical system outcomes
b. Social system outcome
c. Overall success of Kaizen in an organization

The technical system outcomes as explained by (Farris, 2006) comprises of improvement in process, improvement in product quality and overall success of Kaizen in the form of Kaizen goal achievement by the organization. The social system outcomes of the Kaizen implementation as identified though literature review and survey of the automobile sector organizations include human resource development and work area improvement. The effective implementation of Kaizen produces positive change in both social system outcome (human resource development, improvement of work area) and technical system outcome in the form of improvement of product quality and internal processes of the organization.

Literature review on Kaizen indicates that the most common improvements through Kaizen activity include, productivity, quality of product, improvement of processes, improvement in work area (shop floor), set-up time, lead-time, timely delivery and reduction in defect rate(Kosandal & Farris, 2004). Reported improvements in these metrics can be from moderate (25-50%) to significant improvement (75-100%) (Sheridan, 1997b; Cuscela 1998 & Ferrous 2009). However, due to lack of systematic research on Kaizen, the range of "typical" technical system outcomes is not well understood. The most important outcomes of Kaizen among above-mentioned outcomes are process improvement, improvement in work area (shop floor), product quality improvement and overall success of Kaizen in the form of Kaizen goal achievement were selected for this research.

2.18.1 **Organizational Internal Process Improvement (OIPI)**

Built-in quality in the process will ensure monitoring and defect free production / services of the organization. More the quality built-in to the process, there will be fewer number of defective products from the organization when the quality is built into the process more rigorously. The organization utilizes statistical tool and techniques to improve the quality of their product. Kaizen ensures that manufacturing process become leaner and fitter by eliminating waste (Singh & Singh, 2010). Kaizen is originally used to improve the manufacturing process (Suzuki, 1987). Kaizen generates process-oriented thinking (Dehghan et al., 2006). Efforts and resources rendered by the organization for the implementation of Kaizen are wasted when they do not focus on the improvement of their internal process, which is an ongoing process of CI (Berry, 1991).

2.18.2 **Product Quality Improvement (PQI)**

Quality of the product is defined as conformance to product specification to fulfill the customer requirements (Kiyani, Niazi, Rizvi, & Khan, 2012). Product quality can be improved through small incremental changes toward betterment in process, work area of the organizations (Singh& Singh, 2010). Kaizen reduces waste and continuously achieve improvement in productivity and quality(Ahmed, Hassan, & Fen, 2005). Kaizen is the technique of improvement in the quality of product and services(Soderquist, Chanaron, & Motwani, 1997). Kaizen Philosophy aims at developing the product with higher quality (Radharaman et al, 1996). Kaizen improves productivity and sustained competitiveness(Chaudhuri, 1997).

The results of effective Kaizen implementation must be sustainable and focused on overall performance improvement of the organization (Rijnders & Boer, 2004). The main objective of effective Kaizen implementation is reduction of waste, improvement of quality of the products, process (Besant, et al., 1993), work area and development of human resource of the organization (Rungtusanatham, et al., 1997). The effectiveness of Kaizen is judged through achievement of the objective of organization with minimum possible expenditure as compared to other CI techniques and strategies like Business Process Reengineering, Six Sigma and TQM (Ros & Boer, 2001). The supposed outcome of Kaizen include followings:

a. Personal initiative or enthusiasm for Kaizen event participation (Rusiniak, 1996; McNichols et al., 1999; Kumar & Harms, 2004) signified in one case by a waiting

list of volunteers. Workers of the organization take interest in Kaizen and suggest improvement ideas to improve the processes of the organization (Bicheno, 2001).

b. Support for the Kaizen program that is effectiveness of the Kaizen implementation process (Watson, 2002).

c. Employee "buy-in" or commitment to the changes made during the Kaizen implementation due to the participation of target area employees on the Kaizen team (McNichols et al., 1999; Bradley & Willett, 2004).

d. Creation of a belief that change is possible. (Butterworth, 2001)

e. Increased employee empowerment "Keys to Success," (Sheridan, 1997b; Minton, 1998 and McNichols, et al., 1999).

f. Improved employee attitudes towards work (Laraia et al., 1999).

g. Increased cross-functional cooperation, due to the cross-functional nature of Kaizen teams (McNichols et al., 1999; Mika, 2006; Bradley & Willett, 2004).

h. Support for creating a learning organization, by giving employees tools they can apply to improve their daily work activities (McNichols, et al., 1999 and Watson, 2002).

i. Support for lean manufacturing (Bradley & Willett, 2004).

j. Development of a culture that supports long-term improvement (Adams et al., 1999; Laraia, et al., 1999; Smith, 2003; Bradley & Willett, 2004; Drickhamer, 2004b and Martin, 2004).

k. Creation of a "hands on", "do-it-now" sense of urgency for change / improvement in the entire facility. Employee pride in accomplishments made during the Kaizen program (Tanner & Roberts, 2001).

2.18.3 **Human Resource Development (HRD)**

Employee development in the form of enhancement of their skill level and improvement in training standard has been cited as a key outcome factor of effective Kaizen implementation in an organization (McGarrie, 1998). Various changes related to human resource development policies are need to be placed during the course of implementing Kaizen. These changes include

the use of a team approach through quality circles, changes in the organizational structure, changes in the reward and recognition system and changes in corporate culture of the organization. The concepts of worker empowerment (degree of authority and decision making powers given to workers), employees involvement (extent of employee participation in the firm's family efforts) and corporate culture (changes in the company's value and belief system) have been included under this construct.

2.18.4 **Work Area Improvement (WAI)**

Adaption of the orderliness and organization principles being adopted in the 5S program are advocated and promoted by the Japanese in the form of Kaizen tools has a positive effect on work area (shop floor of the organization). Work area can be improved through Kaizen (Teian, 1992). Impact of Kaizen activities on the work area (shop floor) and the overall success of the Kaizen in an organization is good enough (Doolen et al., 2003).

2.18.5 **Overall Success of Kaizen (OSK)**

Percentage of goals achieved by the organization through implementation of Kaizen is considered overall success of Kaizen in the organization. There are very few number of authors who have described measurement of Kaizen (Molina, 2003; Douglas, 2001). As per Brunnet & New (2003), Kaizen is not defined as measuring for the level of finishing point. However, Kaizen can be used to measure the conception of different elements of different construct like Quality Management System (QMS). Furthermore, items adopted from Brunnet & New (2003) do not fit the definition of Kaizen. In this research study Kaizen finishing point level was measured by asking a question to different respondents of the organizations like, in your opinion "what is the degree of accomplishment of Kaizen and how much goals and objective of Kaizen has been achieved in your firm?" Organizations normally measure success of Kaizen from improvement of their internal process, whereas successful implementation of Kaizen in an organization can be measured more accurately from satisfaction level of their customers.

2.19 **A Chronology of Different Factors related to Kaizen**

A list of potential Kaizen factors was iteratively compiled and organized. First, the input and process factors were initially compiled into an uncategorized list, while noting which factors were mentioned by multiples sources. The factors were then inductively grouped into categories

developed by the researcher. This was an iterative process involving an initial grouping and a refinement that combined some initial groups. Finally, the Pinto and Slevin model, Belassi and Tukel models were analyzed to develop categories of input, process and outcome factors of Kaizen. Based on this analysis, the researcher developed three categories of factors related to Kaizen implementation in organizations.

These final three categories of factors identified are presented in Figure 2.13 at the end of this chapter. It is important to note that some of the factors related to the broader context of the Kaizen are outside the scope of this research. Some of these factors were measured to describe the context of the current research, but were not studied as independent variables in this research. As more references beyond the initial few were identified and reviewed, factors mentioned in these sources have been mapped to the initial categories. The abstracts for all sources were reviewed to determine whether the source appeared to be focused on Kaizen philosophy, short-term Kaizen events, e.g. "Kaizen blitz," "Kaizen projects," or long-term Kaizen activities, e.g. CPI. Sources which focused on Kaizen event, Kaizen philosophy and long-term Kaizen activities for which the focus was not clear were fully reviewed.

Previous research on finding different factors affecting Kaizen program and Kaizen activities has focused on broader aspect of Kaizen. This research has focused on specific model related to factors affecting Kaizen in automobile sector of developing countries like Pakistan. Individual Kaizen event success contributes to an overall Kaizen program success. Group design, Kaizen event planning and factors associated with the organizational effect on formulation of Kaizen event (Farris et al., 2009). Certain factors related to Kaizen implementation are management commitment, organizational Kaizen culture, employee's management and training of workers. Design of Kaizen event and Kaizen team have been analyzed to see their significant effect on Kaizen outcome variables in the form of socio-technical outcomes of Kaizen, e.g. human resource development, work area improvement, organizational internal process improvement, product quality improvement and overall success of Kaizen in the form of goal achievement.

After going through peer review and discussion with Kaizen experts / consultants, six important independent variables that may have impact on Kaizen implementation, four process factors and five dependent variables in the form of outcome of Kaizen were identified and

measured for this research. The final list of variables include management commitment to Kaizen, organizational Kaizen culture, Kaizen event and team design, training of workforce, personal initiative taken by the employees of the organizations and rewards & recognition given to participant of Kaizen. Similarly, five dependent variables in the form of Kaizen outcome such as work area improvement, internal process improvement, HR development, product quality improvement and overall success of Kaizen program were measured in this reach study Many factors which have been identified in Kaizen event literature such as Kaizen team experience, team leader experience team autonomy, action orientation tools quality were found not to be significant towards Kaizen event success (Jennifer, et al., 2011). Lack of employee commitment to the Kaizen program is one of the reasons due to which many improvement programs, even those that are initially successful, ultimately fail (Keating et al., 1999).

Table 2.7: A Chronological Literature Review related to different factors affecting Kaizen

S / No	Author / References	Factors Discussed
1	(Imai et al., 1986)	Performance improvement, Quality improvement, Organizational internal process improvement, Learning from mistake, The determining root cause of problems, Change of mindset of individual, Development of a Kaizen culture.
2	(Bessant et al.,1993)	Reduction of waste, Improvement of quality of the products and process, Flexibility and improvement of work area.
3	(Bessant and Caffyn et al.,1994)	Employees cross functional team, Problem solving techniques, Kaizen event duration, Management supports & involvement, Focused on strategy and objective, Leadership and motivation.
4	(Newitt, 1996a)	Focus on HR development, CI management, Focused on internal process improvement.
5	(Belassi & Tukel, 1996)	Management support, Project (Kaizen event) design, Rewards and recognition.
6	(Upton, 1996)	Focused on process improvement, Strategy and objective, Leadership and motivation.
7	(Imai et al.,1997)	Improvement in ways of life, Less expensive, Performance

		improvement, Human resource development, Work area improvement, Product quality improvement, Organizational internal process improvement, Standardization of processes, Training of workers.
8	(Berger, 1997)	Standardization of internal processes, Training of workers, Involvement of employees, Personal initiative of employees, Employees expertise on Kaizen tools and techniques, Work process standardization, Development of human resource of the organization.
9	(Chaudhary, 1997)	Productivity improvement, sustained competitiveness, Development of human resource of the organization.
10	(Dale et al.,(1997)	Training and abilities of workers, Focused on process issues, Leadership and motivation, Focused on cultural issues, Discussed management and information, Learning and skills.
11	(Handfield & Melnyk, 1998)	Action orientated Kaizen, Rewards and recognition, Employees training, Tools performance improvement of individual.
12	(Bessant & Francis 1999)	Sustained problem solving techniques, Small innovation, Empowerment of workforce at shop floor.
13	(Kaye & Anderson, 1999)	Senior management commitment, Focused on customer needs, Integration of CI activities into strategic goal, Kaizen culture, Focusing on internal and external customers, Critical process, Standardization of processes, Feedback system, Learning from CI, Management supports and involvement, Leadership, motivation, Cultural issues, Training and skill level of employees.
14	(Laraia et al.,1999)	Manufacturing process improvement, Enhance quality of the product.
15	(Leblanc, 1999)	Involvement and training of workforce, Kaizen event design, Kaizen team design, Team autonomy, Rewards and recognition.
16	(Bond, 1999)	Performance measurement, Empowerment of team, Management issues, Customer satisfaction, Employees involvement, Cost reduction, Safety, Quality of the product, Process maintenance, and Reengineering, Improvement and Process sustainability.
17	(Terziovski & Sohal,	CI through involvement of all the people at all level of organization.

	2000)	
18	(McAdam et al., 2000).	Culture of innovation, Culture of CI, CI management, Customer orientation, Process orientation.
19	(Brunet, 2000)	Role of employees in Kaizen, Kaizen event and team design, Group targets, Team work, Understanding of Kaizen, Training of workers, Direct compensation (Rewards and recognition), Management support, standardization of internal processes.
20	(Hofstede, 2001)	Collective programming of the mind (Cultural), Performance improvement, Culture's,Values, Behaviors, Institutions.
21	Douglas &Judge, 2001)	Measurement of Kaizen, Structure of the organization, Culture of the organization.
22	(Bessant et al.,2001)	Top management commitment, Cultural change, Lack of training, Rewards and recognition, The impracticality of successful CI activity, The framework of performance enhancement.
23	(Chen et al., 2001)	CI in standard way of work, Change towards betterment, Gradual incremental improvement.
24	(Lillrank et al.,2001)	Motivational level of workforce, Active participation, Management commitment to Kaizen, Knowledge of Kaizen tools and techniques, Top management commitment to Kaizen.
25	(Mika, 2006)	Improvement of target area, Management support, Top management commitment, Rewards and recognition, Kaizen tools and techniques.
26	(Bateman & David, 2002)	Management supports and involvement, Training and abilities of workers, Process improvement, Use of tools and techniques, standardization of processes, Sustainability of CI activity, and Performance assessment criteria.
27	(Brunet & New, 2003)	Measures for successful implementation of Kaizen, Small group activity, Suggestion system, Zero defect, Policy deployment, Total productive maintenance, Human resource development, Kaizen culture, Management oriented Kaizen, Life time job security, Production improvement, Improvement of work environment, Process improvement and Personal initiative of employees.

28	(Nicola Bateman & Nick Rich, 2003)	Resources, Focused on PI, Management, Employees turnover, Measures related to Finance, Culture, Managers approach, Team leaders, Communication.
29	(Miller, 2004)	Management support, Rewards and recognition, Human resource development.
30	(Martin, 2004)	Kaizen event and team design, Rewards and recognition, Kaizen tools and techniques.
31	(Farris et al., 2004)	Attitude, Impact of work area, Impact of worker, Skill, Understanding of need for change, Understanding of need for Kaizen, Overall perception of event success.
32	(Neely, 2005)	Performance measurement and evolution
33	(Bhuiyan et al., 2005).	Customer service, Understanding the quality system, Project team formation, Management representative, Quality policy and objective, Training of shop floor personnel, Internal audit criteria, Preventive maintenance, Rework, Inspection, Quality perception, Top management commitment. Resistance to change, Resources and Training.
34	(Huls, 2005)	Rewards and recognition, Kaizen tools and techniques.
35	(Ahmed Shah, 2005)	Performance measurement and evolution.
36	(Bateman, 2005)	Management support, Top management commitment, Organization culture, Employees commitment to Kaizen.
37	(Farris, 2006)	Literature review conducted, Development of a Kaizen culture in the organization, Development of Kaizen support structure of the organization, Technical system outcomes, Improvement in process, Improvement in product quality and Overall success of Kaizen, Management Supports to Kaizen team.
38	(Yan-Jiang, Lang, & Xiao-na, 2006)	Increased productivity, Improved quality, Cost reduction, Customer satisfaction, Process improvement, Top management team.
39	(Jørgensenet al.,2006)	Increase productivity, Reduced cost, Reduced lead time, Improved reliability, Improve customer and supplier relationship, Higher

		customer satisfaction, Improved quality performance, Improved work area and safety, Increased employee commitment, Increased attitude towards change, increase employees skill and competency level.
40	(Khan et al., 2007)	Change through Kaizen, Kaizen training is cost effectiveness, Kaizen is a resource effective philosophy, Kaizen uses people skills and team work, Kaizen can be pre-cursor to introduce world class manufacturing, Management commitment and support, Management awareness, Management education, Shop floor workers awareness, Support and commitment, Training in SME, involvement and commitment of management and shop floor workers, increased competitiveness, Sustained competitive advantage, Increased flexibility, Increased competitiveness of supply chain, Increased employee involvement, Better communication and teamwork, Multi-skilled workforce.
41	(Doolen et al.,2007)	Co-strategy for CI, Enhance competitiveness of the organization, Involvement of internal customer of the organization.
42	(Lewis, 2007)	The use of Kaizen event design elements like teams and event design, Kaizen tools and techniques.
43	(Martin & Osterling, 2007)	Rewards and recognition to the employees of the organization, Kaizen events, Kaizen tools and techniques.
44	(Aoki, 2008)	Fundamental principles of Kaizen, Management support, Top management commitment.
45	(Farris et al., 2008)	Kaizen event design, Kaizen team experience, Kaizen team leader experience, Event planning process, Management support, Work area routineness, Kaizen event process, Action orientated Kaizen, Affective commitment to change, Internal process, Quality tool, Attitude, Overall perceived success, Impact on area.
46	(Farris et al., 2009)	Kaizen event & team design, Organizational work area improvement, Management support, Action orientation, Effective commitment to change, Internal process improvement, Kaizen tool appropriateness, Human resource development, Goal achievements, Overall perceived

		success of Kaizen, Understanding skills level and attitude development of Kaizen participant, Kaizen effectiveness, Management Supports to Kaizen team, Team functional heterogeneity, Work area routines, Kaizen team experience, Team leader experience, Tool quality.
47	(Wong et al., 2009)	Employees' motivation, Organization culture, Material handling, Work processes, Management support, Tools & techniques, Improved product quality.
48	(Sing and Sing, 2009)	Improvement of Quality of the product, Improvement of internal process of the organization, Performance Improvement of the organization, Work area improvement, Human resource development,
49	(Malik, Iqbal, Shaukat, & Yong, 2010)	Top management commitment, Customer focused, Employees involvement and empowerment, Work area improvement, Performance improvement.
50	(Van Aken et al., 2010)	Kaizen event goal clarity, Goal difficulty, Kaizen team experience, Team function heterogeneity, Team autonomy, Team leader experience, Management support, Work area routineness, Kaizen event planning process, Action orientation, effective commitment to change, Internal process improvement, factor related to sustainability of Kaizen event, enabling process for CI to take place, Supportive management infrastructure, Organization culture, organization resources, Leadership and Communication.
51	(Ehsan et al., 2010)	Work area improvement, Human resource development, Product quality improvement, Organization internal process improvement.
52	(Glover et al.,2011)	Production processes improvement, Involvement of internal customers, Work area improvement, Work process improvement,
53	(Oprime et al., 2011)	Staff training on Kaizen tools and techniques, incentives for suggestions, Communication, Supportive culture, Regular shop floor visit, Improvement in productivity, Strategy for CI, Organization infrastructure, Quality, Lead time, Cost, Customer satisfaction, HR

		development, Enhancement of skill level, Availability of tools, Problem identification, Management support, Improvement monitoring, Quality awards,
54	(Nordin et al., 2011)	Lack of understanding of lean concept, Employees attitude, Leadership and management, Supportive Kaizen culture, Finance, Skill and expertise of employees, Process and equipment, planning and control, Human recourse development. Supplier and customer relationship.
55	(Garcia et al., 2012)	Management involvement, Workers involvement, Leadership, Setting objectives, Provision of resources, Kaizen event design, Culture of an organization, Training and abilities of workers, Management support, and Top management commitment.
56	Yokozawa et al., 2012)	Organizational culture, Organizational structure, Personal initiative,
57	(Junburg, 2013)	Personal initiative, Motivational level, Commitment from management, Kaizen Culture, Establish strategy for CI, Training of workers, Kaizen tools and techniques, Understanding and awareness of Kaizen tools and techniques, Competency, Organization structure, Allocation of resources, Careful selection of project, CI process,
58	(Li, & Doolen, 2013).	Top management commitment, Training of workers, Middle management commitment, First line management commitment, Internal and external support, Rewards and recognition, Encouragement of bottom up communication, Stable working environment, Goal clarity, Goal difficulty, Overall success of QCC, understanding of CI, Skill, attitude & motivation level enhancement.

2.20 Selected Variables for Theoretical Research Framework

Summary of selected variables as identified from literature review and use in the theoretical research framework, are given in table 2.8.

Table 2.8: Summary for Selected Variables for Theoretical Research Framework

S/No	Name of Variable	Reference from Literature Review
1.	Top Management Commitment	(Bessant et al., 2001; Lillrank et al., 2001; Mika, 2002; Harman et al., 2002; Boyer, 2002; Bhuiyan et al., 2005; Bateman, 2005; Yan-Jiang, Lang, & Xiao-na, 2006; Aoki, 2008; Malik, Iqbal, Shaukat, & Yong, 2010; Garcia et al., 2012; Li, & Doolen, 2013).
2.	Organization Culture	(Imai et al., 1986; Kaye & Anderson, 1999; McAdam et al., 2000; Hofstede, 2001; Judge & Douglas, 2001; Brunet & New, 2003; Nicola Bateman & Nick Rich, 2003; Bateman, 2005; Farris, 2006; Wong et al., 2009; Van Aken et al., 2010; Oprime et al., 2011; Nordin et al., 2011; Garcia et al., 2012; Yokozawa et al., 2012; Junburg, 2013).
3.	Personal Initiative	(Berger, 1997; Harman et al., 2002; Nicola Bateman & Nick Rich, 2003; Yokozawa et al., 2012; Junburg, 2013).
4.	Rewards & Recognition	(Belassi & Tukel, 1996; Handfield & Melnyk, 1998; Leblanc, 1999; Brunet, 2000; Bessant et al., 2001; Mika, 2002; Miller, 2004; Martin, 2004; Huls, 2005; Martin & Osterling, 2007: Oprime et al., 2011: Li, & Doolen, 2013).
5.	Training of Workers	(Imai et al., 1997; Berger, 1997; Dale et al., 1997; Handfield & Melnyk, 1998; Kaye & Anderson, 1999; Leblanc, 1999; Brunet, 2000; Bessant et al., 2001; Harman et al., 2002; Bateman & David, 2002; Bhuiyan et al., 2005; Khan et al., 2007; Oprime et al., 2011; Garcia et al., 2012; Junburg, 2013; Li, & Doolen, 2013).
6.	Kaizen Event and Team Design	(Leblanc, 1999; Brunet, 2000; Martin, 2004; Farris et al., 2009; Lewis, 2007; Martin & Osterling, 2007; Farris et al., 2008; Garcia et al., 2012).
7.	Employees Commitment to Kaizen	(Berger, 1997; Bond, 1999; Brunet, 2000; Nicola Bateman & Nick Rich, 2003; Bateman, 2005; Jørgensen et al., 2006; Khan et al., 2007;
8.	Action Orientation	(Handfield & Melnyk, 1998; Martin & Osterling, 2007; Farris et al.,

	Kaizen	2008; Farris et al., 2009; Van Aken et al., 2010; Jennifer, et al., 2011; Glover et al., 2011).
9.	Employees Knowledge about Kaizen Tools & Techniques	(Lillrank et al., 2001; Berger, 1997; Handfield & Melnyk, 1998; Lillrank et al., 2001; Mika, 2002; Boyer, 2002; Bateman & David, 2002; Martin, 2004; Huls, 2005; Lewis, 2007; Martin & Osterling, 2007; Wong et al., 2009; Oprime et al., 2011; Junburg, 2013).
10.	Standard Organizational Internal Process	(Imai et al., 1997; Berger, 1997; Brunet, 2000; Kaye & Anderson, 1999; Bateman & David, 2002; Oliver, 2009; McNichols, Hassinger, & Bapst, 1999; Manos, 2007; Moosa, 2009).
11.	Human Resource Development	(Newitt, 1996; Imai et al., 1997; Berger, 1997; Chaudhary, 1997; Brunet & New, 2003; Miller, 2004; Farris et al., 2009; Sing and Sing, 2010 & 2009; Ehsan et al., 2010; Oprime et al., 2011; Nordin et al., 2011).
12.	Work Area Improvement	(Bessant et al., 1993; Imai et al., 1997; Farris et al., 2004; Jørgensen et al., 2006; Farris et al., 2008; Farris et al., 2009; Sing and Sing, 2010 & 2009; Malik, Iqbal, Shaukat, & Yong, 2010; Van Aken et al., 2010; Ehsan et al., 2010; Glover et al., 2011).
13.	Organizational Internal Process Improvement	(Imai et al., 1986; Imai et al., 1997; Ehsan et al., 2010; Oprime et al., 2011; Brunet & New, 2003; Rijnders & Boer, 2004; Stern, 2006; Singh & Singh, 2010; Dehghan et al., 2006;).
14.	Product Quality Improvement	(Imai et al., 1986; Salis and Hingley, 1992; Bessant et al., 1993; Wilkinson, 1995; Imai et al., 1997; Laraia et al., 1999; Bond, 1999; Farris, 2006; Yan-Jiang, Lang, & Xiao-na, 2006; Jørgensen et al., 2006; Sing and Sing, 2010 & 2009; Wong et al., 2009; Ehsan et al., 2010).
15.	Overall Success of Kaizen	Bessant et al., 2001; Douglas, 2001; Doolen et al., 2003; Molina, 2003; Brunet & New, 2003; Farris, 2006; Farris et al., 2008; Farris et al., 2009; Manos, 2007; Li 2011).

2.21 **Research Framework Formulated for this Study**

The research model structure was based on Key factors affecting Kaizen implementation (Farris, 2006). Different independent, dependent and process variables were measured in the form perceptual data, gathered from 54 organizations selected systematically from initial survey of automobile sectors organization of Pakistan including multinational firms like Toyota, Honda and Suzuki motors in Pakistan. Kaizen effectiveness was explained through regression analysis using SPSS and through identification of predictors and criterion variables.

The research began with identification of different factors affecting Kaizen implementation in an organization through review of the literature. The research variables selected through literature review for this study were based on the model developed by (Farris et al., 2009). The model consists of input variables, process variables and outcome variables related to Kaizen implementation in an organization. Potential relationship among these variables was identified. The study focuses on the development of model consisting of different variables having strong correlation with outcomes of effective Kaizen implementation.

The research was undertaken to find out the effects of different input variables related to organization management, employees commitment, organizational culture and Kaizen event and team design on outcome variables of Kaizen implementation in the form of human resource development, work area improvement, internal process improvement, improvement in quality of the product and overall success of Kaizen in the form of goal achievement. The research framework selected for this research is shown in Figure 2.13.

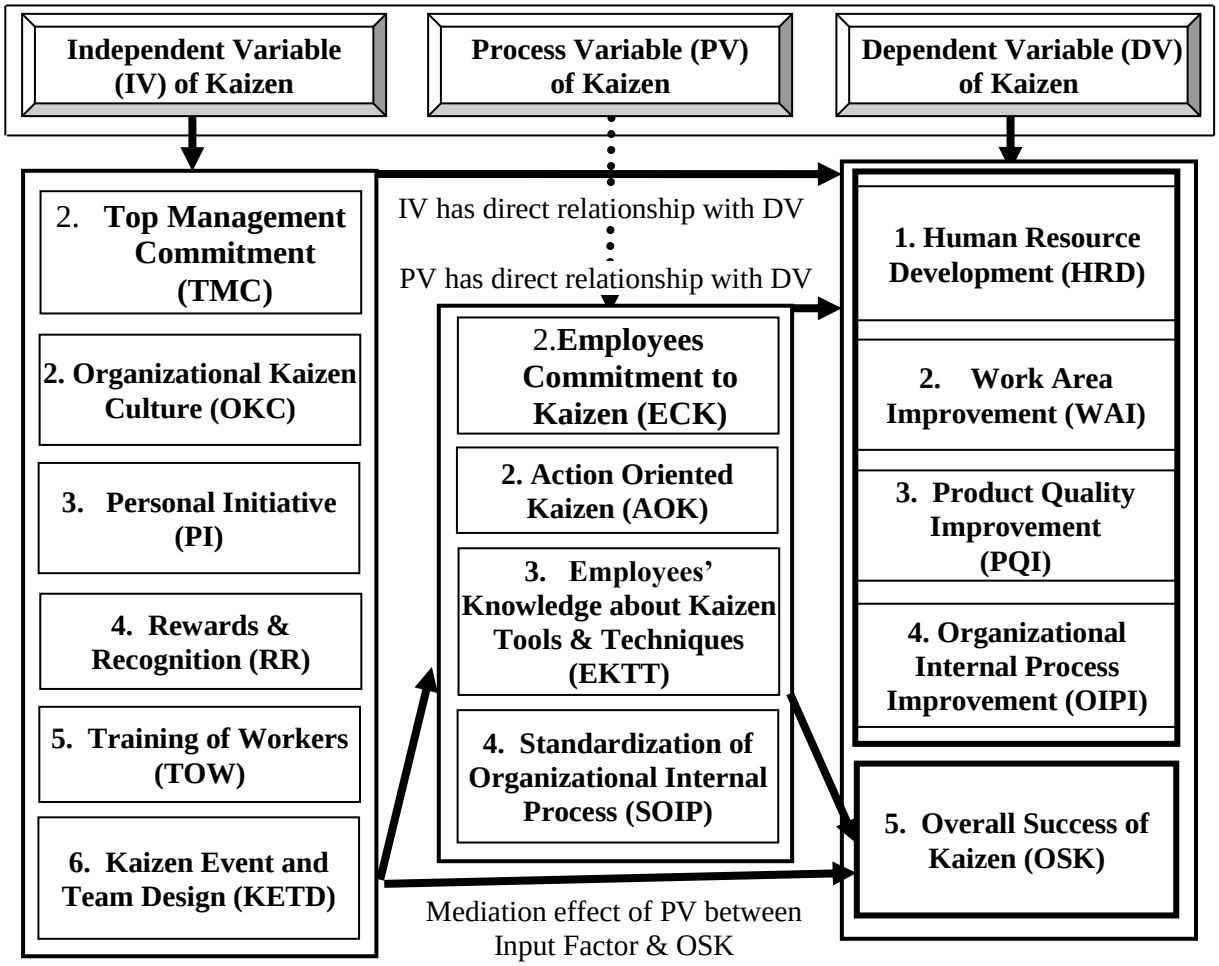


Figure 2.13: Research Framework of different factors under Input, Process and Outcome Factors of effective Kaizen Implementation

2.22 Meanings of Input Factors for Measure of Respondents Perception

Meanings of independent variables as extracted from literature review are used to measure the perception of respondents from automobile sector organizations of Pakistan and are given in Table 2.9.

Table 2.9: Meaning for Perception Measurement of Input Factors

Variable Name	Meaning and Measurement of Variable
1. Top Management Commitment (TMC)	According to Farris et al. (2009), extent by which an organization top management commits time and resources in the planning, design and execution of Kaizen activities. The factor describes commitment of top

	management towards effective implementation of Kaizen in their organization. Perception of respondents from management and shop floor workers regarding commitment of top management towards successful implementation of Kaizen was measured.
2. Organizational Kaizen Culture (OC)	According to Ahmed et al., (2001) the culture of encouragement from organization management regarding finding mistakes and bringing them to the knowledge of top management to find their solution through involvement of workers for CI of the organization. Through this factor perception of top, middle management and shop floor workers regarding presence of Kaizen culture in their organization and its effect on effectiveness of Kaizen were measured.
3. Personal Initiative of Employee (PI)	According to Wiljeana, (2011) this factor describes employee's dedication to their profession, personal initiative and willingness of workers to carryout Kaizen activities. When employees are willing and dedicated to identify and solve the problems, only then Kaizen activities can be successful for CI of the organization. Through this factor the perception of management &shop floor worker regarding personal initiative of workers towards Kaizen activities in their organization and its effects on Kaizen effectiveness was measured.
4. Rewards and Recognition (RR)	According to Dentset at., (2009) this factor indicates the culture of giving rewards and recognition to its employee's in an organization. Perception of management as well as shop floor workers regarding presence of culture of rewards and recognition on Kaizen activities in a way that cooperative culture and team work can bring synergy in Kaizen activities and its effect on successful implementation of Kaizen in their organization is measured. If the culture, people and system is supportive and encourages improvement activities in the organization as a whole then the Kaizen would be successful in the organization.
5. Training of Workers (TOW)	According to Wiljeana, (2011) and Martin et at. (2007) this factor means training and education of workers on different Kaizen tools and techniques. Employees need to be educated and trained on key aspects

	such as problem identification, team building, empowerment, problem solving and expertise on statistical tools and techniques in planning, designing, implementation and monitoring of continuous improvement or Kaizen activities in their organizations. Perception of organizational employees and management regarding effects of training of workers on effective implementation of Kaizen in their organization was measured.
6. Kaizen Event and Team Design (KETD)	According to Farris et al., (2009) this factor indicates selection of problem as a Kaizen event & team members keeping in view the team experience, competency level, heterogeneity for solution of the problem. The most important factor that affects Kaizen is the competency level of the Kaizen team. The more competent the Kaizen team is, the more are the chances of solution of problems. Management, Kaizen team members and team leader's point of view regarding importance of Kaizen event and team design in its effective implementation within their organization was measured through survey questionnaire.

2.23 **Meanings of Process Factors for Measure of Respondents Perception**

Meanings of process variables as extracted from literature review is used to measure perception of respondents from automobile sector organizations of Pakistan are given in Table 2.10.

Table 2.10: Meaning for Perception Measurement of Process Variables

Variable Name	Meaning of Variables
1. Employee's Commitment to Kaizen(ECK)	According to Brunet & New (2003), and Wiljeana (2011), this factor indicates commitment of employees of the organization toward effective implementation of Kaizen activities within their own organization. Perception of the management as well as shop floor workers involved in Kaizen activities regarding commitment of the employees to Kaizen and its effects on outcome of Kaizen in their organization was measured in quantitative terms.
2. Action Oriented Kaizen (AOK)	According to Farris et al., (2009) & Jennifer et al., (2011), this factor describes activities of Kaizen team towards the problem solving.

	Actual time spent by the Kaizen team on Kaizen activities such as brain storming discussion on tools and techniques needed to solve the problem and team meeting off line and effects of all these activities on outcome of Kaizen activities within the organization. Perceptions of the management as well as shop floor workers involved in Kaizen activities regarding time spent by employees on Kaizen activities and its effect on outcome of Kaizen in their organization was measured on Likert scale 1 to 5.
3. Expertise on Kaizen Tools & Techniques (EKTT)	According to Ahmed et al., (2001) and Brunnet & New's, (2003) this factor indicates expertise of Kaizen team members and team leader on Kaizen tools and techniques for its effective implementation. Perception of the management as well as shop floor workers, regarding expertise of the employees on Kaizen tools & techniques and its effects on outcome of Kaizen in their own organization was measured.
4.Standardization of Organizational Internal Process (SOIP)	According to Martin et at., (2007) and Jennifer et al., (2011) this factor indicates standardization of the organizational internal process for effective implementation of Kaizen. Without standardization improvement cannot be measured. Perception of the management as well as shop floor workers, involved in Kaizen activities, regarding standardization of organizational internal process and its effect on outcome of Kaizen in their organization was measured.

2.24 **Meanings of Outcome Factors for Measure of Respondents Perception**

Meanings of outcome variables as extracted from literature review are used to measure perception of respondents from automobile sector organizations of Pakistan are given in Table 2.11.

Table 2.11: Meaning for Perception Measurement related to Outcome Variables

Nature of Variable	Meaning of Variable
1. Human Resource Development (HRD)	According to Farris et al., (2009), this variable describes the increase in skill level, attitude and understanding level of Kaizen of supervisors and workers. Through this variable perception of management as well as workers working as Kaizen team members and team leaders regarding improvement of skill level, attitude and understanding of Kaizen due to effective Kaizen implementation in their organization was measured.
2. Work Area Improvement (WAI)	According to Dents et at. (2009), this variable describes the improvement in layout of the organization and general cleanliness of the shop floor within organization. Through this variable perception of management as well as workers working as Kaizen team members and Kaizen team leaders regarding improvement in layout and cleanliness of the shop floor due to Kaizen activities in their organization was measured.
3. Product Quality Improvement (PQI)	According to Ahmed et al., (2001), this variable describes the reduction in rejection rate of the product and enhanced satisfaction level of customers of the organization. Through this variable perception of management as well as workers working as Kaizen team members and team leaders regarding improvement of quality of their product due to Kaizen activities in their organization was measured.
4. Organizational Internal Process Improvement (OIPI)	According to Dehghan et al., (2006) &Martinet at. (2007), this variable indicates improvement in internal process of the organization through Kaizen activities. Perception of management and employees of the organization regarding improvement in internal process of their own organization due to effective implementation of Kaizen was measured.
5. Overall Success of Kaizen (OSK)	According to Farris et al., (2006) and Li (2011), this factor indicates overall goal achievements by the organization through Kaizen and measure of satisfaction level of customers of the organization. The

	perception of management and shop floor workers of the organization regarding Kaizen goal achievement and customers satisfaction level has been measured thorough this factor.

2.25 **Summary**

This chapter consists of literature review that is related to Kaizen Philosophy; Kaizen event and Kaizen blitz; and different models / frameworks related to CI of performance, quality, and process of the organization. The project success factor theory, project team effectiveness theory, and identification of critical factors affecting Kaizen implementations and its outcomes have been discussed. Systematic literature review and methodology of literature review has been explained before carrying out the detailed review of literature on Kaizen. Literature regarding history, importance of Kaizen and its deference with Kaizen event, Innovation and TQM has been identified and important points are also highlighted.

Different tools and techniques under the umbrella of Kaizen have been explained in this chapter. Different Kaizen models and framework related to Kaizen were discussed along with their strength and weakness. Different factors affecting Kaizen implementation and socio-technical outcome as given in the literature of Kaizen were highlighted. Meaning and measurement of perception of respondent regarding input, process and outcome selected for this research study have been explained. At the end of the chapter, the summary of the literature review along with research framework has been presented.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses different aspects of research design and methodology adopted by the author. Different factors related to input, process and outcome of Kaizen implementation have been explained. The chapter also explains the method of measurement of individual perceptions regarding different variables. Data collection, management, screening, factor analysis, and scale reliability confirmation has been discussed. Exploratory and Confirmatory factor analysis were performed to determine validity and internal consistency of the survey scale items. Empirical analyses of data have been carried out using different software such as SPSS, Mini Tab and MS Excel sheet.

The research design is multisite field study through circulation of survey questionnaire. Organizations related to automobile and their parts manufacturing, along with service sector, using Kaizen practices were identified through Phase-1 of the survey. In Phase-II of the survey, perception of respondents from top management, middle management and shop floor workers of different organizations regarding different variables related to effective implementation of Kaizen was measured. Statistical analysis of data in the form of Pearson Correlation test was carried out to identify correlation between input, process and outcome variables of Kaizen. Similarly, Multiple Regression Analysis was performed to develop regression models for each outcome of Kaizen. Testing of working theory regarding different variables related to Kaizen implementation in an organization was empirically analyzed through correlation study.

3.2 Research Design

According toZikmund, Babin, Carr, and Griffin (2012), “the research design is a master plan formulated to highlight the way research study will be undertaken”. As per Sekaran (2003), research design comprised of “a series of rational decision making choice”. The steps involved in research design include data collection, screening, management and statistical analysis using different tools and techniques. A research design provides a framework or a plan of action for the research. Choosing the research design, normally depends upon purpose of research and context of research (Zikmund, 2003). In qualitative research description of circumstances, people and situation for collection of data is done by using words. In quantitative research, data is collected by numerical description of situation people and circumstances measured through

perception of individual respondent (Cooper, Schindler, & Sun, 2006b). Quantitative research can also be described as the way of precisely measuring operational variables (Cooper, Schindler, & Sun, 2006a).

In literature of social sciences, four major categories of research design have been explained (O'Leary, 2004). These categories are as follows:

a. Descriptive research design

b. Co-relation research design

c. Experimental research design

d. Quasi experimental research design

Finding of relationship among various variables can be termed as correlation study. When these correlation studies are conducted in field organizations then they are called field observational correlational studies (Sekaran, 2003). In correlation study, the researchers measures the association (correlation) between two variables within a single group of participants whose response have not been influenced by the researchers. The two variables are said to be correlated when, there is a systematic relationship between them i.e. if value of one variable changes the value of other variable also changes in a uniform and predictable manner.

The correlational method addresses different kinds of research questions. Different types of statistical methods are applied to the relationship among different variables being studied. The experimental method and quasi-experimental method both use different type of statistical tools in a controlled environment. The conclusion based on the findings from both type of studies, is very different. In causal method, one determines only the type of casual relationship between two variables. The correlation method helps to detect systematic correlation between two variables, but it cannot distinguish among the three possible relationships that generate co-variation i.e. causality, a moderator relationship, or a spurious relationship resulting from a third variable. The quasi-experimental method allows detecting systematic differences between different groups and conditions, but does not allow inferring the causes of these differences. Correlation studies are performed on survey based exploratory research.

According to Hair (2007), the most commonly used technique to collect the primary data concerning the hypothesized relationship is the design of a survey questionnaire. Research design classified as a field study with cross-sectional (correlation) study (Kerlinger Fred & Lee

Howard, 2000). One of the main purposes of this research is to provide a valid and a reliable framework developed through finding the relationship between six independent variables with five outcome variables of effective implementation of Kaizen in an organization.

To achieve the research objectives, both qualitative and quantitative research approaches were adopted. Variables under study were measured by designing self-administered questionnaire. The correlational method as recommended by Churchill, (1979) was selected for this research because it has been widely accepted by researchers (Flynn, Sakakibara, Schroeder, Bates, & Flynn, 1990). Multi scale items which decrease measurement errors and increase reliability were selected for obtaining multifaceted constructs and can be shared to allow the particular items to be averaged (Churchill, 1979).

According to Churchill (1979), there are two types of survey based research approaches which can be applied in correlation studies. These two types of research are shown in Figure 3.1. The longitudinal research approach considers the measurement over time (to see change before-after scenario), whereas the cross-sectional research approach involve a sample from the population of interest at one time. The use of cross-sectional research approach is considered more pertinent to this research. It provides a snapshot of the variables of interest at a single point in time which is required to achieve the objectives of the research study.

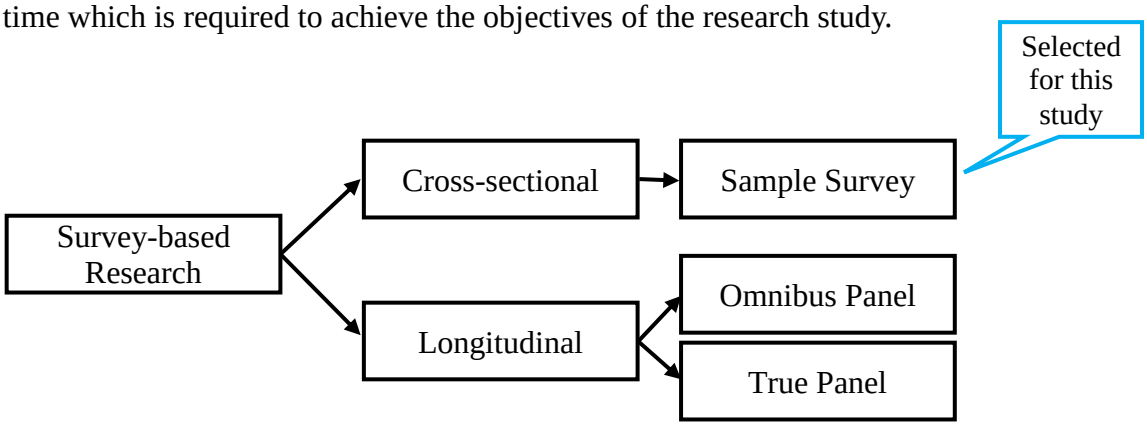


Figure 3.1: Types of Survey Based Research as defined by (Churchill, 1979)

Steps of research design as defined by (Churchill, 1979) along with generalized steps used in research process are shown in Figure 3.2 and 3.3.

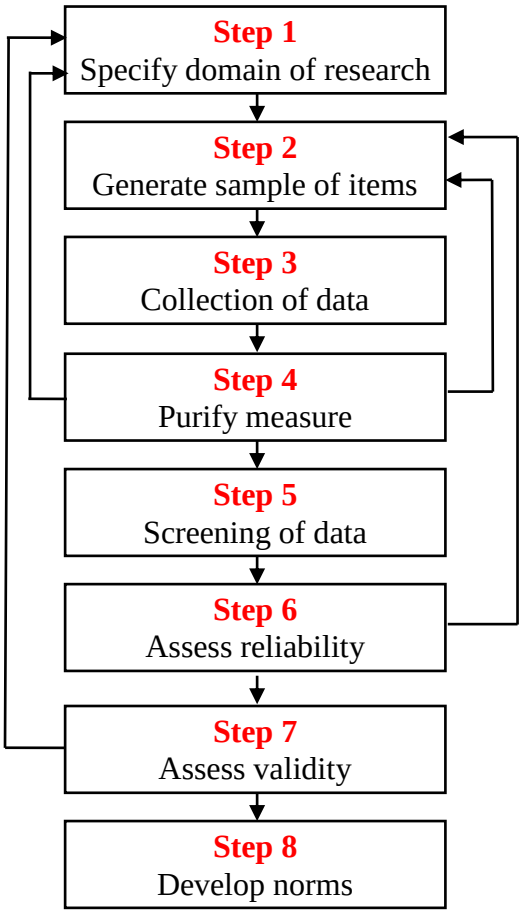


Figure 3.2: Various Steps of Research as defined by (Churchill, 1979)

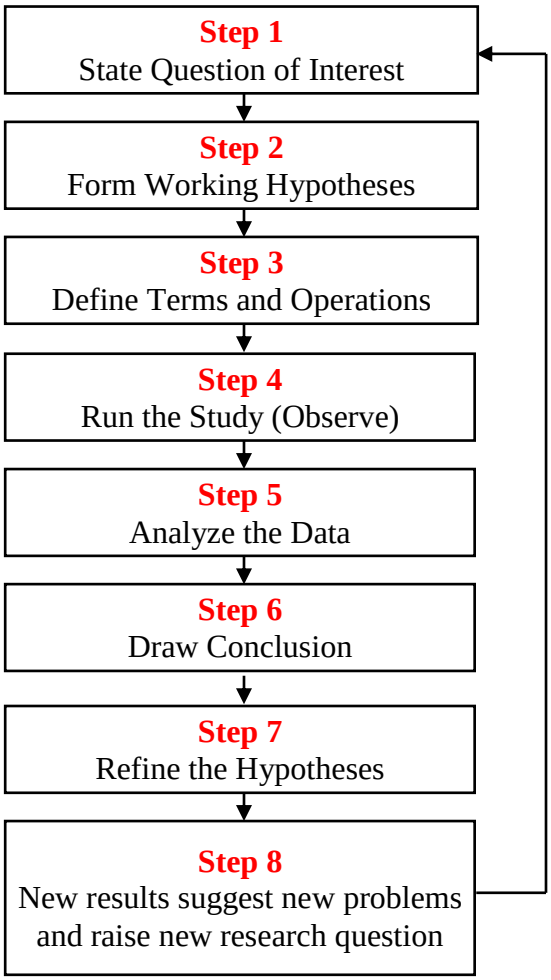


Figure 3.3: The Generalized Steps in Research Study

The research process follows a fairly predictable sequence of events. The steps presented in Figure 3.3 take the researcher from an initial question of interest through process of gathering data till drawing of conclusion. The research comprises of a series of connected projects that build on one another, creating what can be called as "research literature" on the topic. Before conducting a study, most researchers familiarize themselves with the literature on their topic in order to see what other studies have already discovered and which puzzles still remain unsolved.

Research project typically begins with the statement of a question of interest, along with a hunch about the answer one will obtain, the working hypothesis. The working hypothesis should be based on a thorough review of the relevant literature. Good scientific hypotheses are

testable. This means that all of the terms in the hypothesis must be observable i.e. it must be possible to develop valid operational measures for each element in the hypothesis.

3.3 Logic of Measuring Perceptions

This research is based on the perceptions of the respondents that are measured through survey questionnaire. For example, it does not measure the quality of product from the laboratory results, but asks from internal and external customers of the organization as to how much they are satisfied with the product/ services of the organization. Similarly, management and shop floor workers working in the organization were asked that how they consider the effect of different variables on effective implementation of Kaizen and its outcomes in their organization. Survey does not measure the success level of Kaizen in an organization, but asks people to respond to a number of questions about the overall success of the Kaizen.

In order to make the result more reliable, the perception of more than one respondent from each organization was measured. This technique is different from some of the earlier research which relies on feedback from one key person from each surveyed organization (Ghobadian & Gallear, 2001; Oakland & Tanner, 2007). There is a high risk of biased perception in case of single respondent from each organization.

Secondly, the subjective impression of respondents does not misrepresent a good measurement since there is a strong correlation between subjective and objective performance measurements. Furthermore, the judgment is primarily an assessment by the respondent in comparison to the most important competitor in the market (Slater & Narver, 1996). Like objective data study, there are many shortcomings and limitations in the study of subjective data. This includes the wrong perceptions of individuals or even groups. Whether the respondents are really answering with their true feelings or not is the question that arises?

The findings of this study are not 100 % free from such bias. However, some parts of such bias were reduced by noting down standard deviation in response of each individual regarding survey scale items. The involvement of respondents is made through physical interviews to assess the feelings with respect to the researcher's observations and comparing responses from other respondents of the same organization. Overall, it does provide the lead towards understanding the effectiveness of Kaizen from many dimensions, especially from the

organizational culture, commitment of employees to their work and from leadership point of view.

3.4 Judgment on the Effectiveness of Kaizen

It is not easy to measure quantifiable outcomes of effective Kaizen implementation, especially non-financial aspects. There are many other factors, such as, management commitment, organizational culture, personal initiative taken by the employees, business environment, reward and recognition given to employees on their achievement through Kaizen training of workers and design of Kaizen event and team which are known to be responsible for better outcomes of Kaizen. It is generally believed that Kaizen implementation helps in improving the performance of the organizations (Doolen et al., 2008).

The understanding of effectiveness of the Kaizen implementation depend upon certain critical outcome variables of this research. Various studies and research works on Kaizen implementation show that different ways and means have been adopted by the researchers to measure the effectiveness of Kaizen. In some cases, only tangible measures such as financial outcomes (profitability, business volume, market share, etc.) are addressed. Most eminent of this research includes the study by (Hendricks & Singhal, 2001) where the financial and other tangible parameters of companies were measured from stock market point of view. However, that research lacked measure of many intangible and soft measures, such as organization culture, human competency level, vendors' relations, customers trust, leadership etc. It does not provide answers to many cultural issues and challenges. Moreover, there were two issues with measuring tangible factors. One is that they do not represent the holistic picture of organizations and second one is that the validity and reliability of the data itself is the issue.

The data presented in the annual audit reports of companies may also be quite questionable at times. The declared profitability may not be the true reflection of growth or the data may not reflect the actual situation in reality. There are ample examples of the public limited companies who declare losses while actually they enjoy profits, or the other way around. The company can also be profitable while being in monopoly and its employees are demotivated or stressed. At the same time there are many other outcomes which are important to see the health of Kaizen implementation in an organization. These outcomes include human resource development, work area improvement, internal process improvement, improvement in quality of

the product, involvement of people values, creativity, good decision making, leadership, effective communication, goal achievements etc. Such outcomes are important to take into consideration when carrying out the study on Kaizen implementation.

At times, some of the easy looking outcomes are hard to measure, e.g. people think that it is easy to measure the satisfaction level of customers, vendors, or employees, while it is difficult to measure their loyalty and inner feelings. They can only tell what the supplier wants to measure or what they want to tell. Their true feelings are not necessarily captured in most customers' surveys. For this reason, it is really difficult to conceive and measure the true outcomes of organizations in their entirety. Although the tangible and quantitative data in research are highly appreciated. One has to be careful while looking at the data. The data can be quantitative and statistically reliable, but the basis of measures of variables selected for the study may be either objective or subjective.

An objective data is the number of persons buying from a shop, while subjective data is the personal views of the individual about the behavior of sales persons. The data can be quantitative as the survey questions are most often measured on Likert response scale 1-5, i.e. strongly disagree as a numeric (1) and strongly agree as a numeric (5). However, the views of a person about the behavior of an individual are his/ her personal views based on the way question is put, circumstances in which questions were asked, mood and type of customer, time of data collection, relation with the one who is asking questions, and the way data is collected, etc. Soon after converting the data in a numeric value, there is tendency by people to treat the data as quantitative, perform statistical analysis and come up with focused conclusion. Such statistical inferences then become more convincing and people tend to believe them easily.

3.5 **Survey Instrument Development**

The aim of survey instrument development was to measure the perception of respondents regarding different factors related to theoretical framework of Kaizen. The survey questionnaire is designed to test the relationship proposed in the research framework. Multi-scale items survey questionnaire was developed with little modification in questionnaire already existing in the literature and used by Farris, (2006) and Farris et al., (2009) along with addition of few question. The survey questionnaire was developed in three stages. Initially the literature related to Kaizen implementation / quality management framework was reviewed. Measures related to Kaizen

implementation with high degree of reliability and validity were identified. These items were slightly modified as per requirement of research. Research variables include subjective and perceptual factors. These variables were identified from literature review related to Kaizen.

The approach used by Flynn, Schroeder, & Sakakibara, (1994) is widely accepted for survey instrument development based on a Likert scale from 1 to 5 (1 = strongly disagree; 2= disagree; 3= neutral; 4= agree; 5= strongly agree) to measure perception of respondent regarding different input, control and outcome variables of Kaizen. The survey questionnaire consists of two parts. Part-I was related to demography and Kaizen practices being followed by the respondent's organizations from automobile sectors of Pakistan. The awareness and competency level of management and shop floor workers, implementation status of different quality tools and techniques in these organizations were identified through this section of survey questionnaire. Whereas in Part-II of the survey questionnaire, different survey scale items related to input, process and outcome variables of Kaizen were developed as been used by previous researcher such as Farris et al., 2006 in this field. The research objectives were subdivided into more investigative questions which need data collection for its analysis purposes.

Since most of the literature on Kaizen is found in English, therefore the instrument was first developed in English. Keeping in view the environment of Pakistani organizations, where shop floor workers are not well educated, an Urdu version of the same questionnaire was prepared. In order to avoid bias in research findings, the instrument was designed in such a way that it should be easily understood and that there should not be any confusion among respondents related to any survey scale item. Furthermore, few English terms were translated into Urdu along with additional explanations of the terms so that respondents feel comfortable while responding the survey questions.

During stage II of survey questionnaire design, suggestions / inputs from practitioners, proponent from this field were also obtained. After translation of English version of the questionnaire into Urdu, the Urdu version instrument was formally presented to various people organizational internal customers including persons from top management, middle management, shop floor workers, practitioners, consultants, and experienced quality managers during the visit of the author to different organizations. Their opinions about following were obtained:

a. Whether the items were stated in a shared vocabulary

b. Whether the items were precise and unambiguous to answer the question

c. Whether there were biased wordings

d. Suggestions from respondents on ease of comprehension of questions

e. Clarity on specific scale items and possible change in the survey questionnaire

Their suggestions were evaluated carefully by the researcher and on the basis of their response, certain alterations were made in Urdu as well as English version of survey questionnaire. Their main concern was the length of survey questionnaire. Few unimportant questions were dropped on their recommendations.

3.6 **Pilot Study**

The authenticity of research result depends upon the correctness of the data. Whereas correctness of the data collected through survey depends upon reliability and validity of the survey questionnaire design, structure and its pilot testing (Lewis, Thornhill, & Saunders, 2003). While collecting the attribute data through individual opinions, the difference in opinion of more than two respondents is the real variation resulting from difference in interpretation and understanding of a question (Breyfogle & Forrest, 1999). In order to avoid this difference of opinion (measurement errors) and to make sure that the data collected is reliable, the repeatability error was tested during stage III of questionnaire development. Three test respondents filling the questionnaire at two different times on alternate days and matching the results. Lewis et al., (2003), call this repeatability test "test re-test". Results of this re-test analysis allowed to understand that no major repeatability issues exist.

Since a modified questionnaire needs to be validated and tested for reliability and validity before conducting the main survey for collection of data, a pilot study of questionnaire was conducted on 25 respondents from automobile sector organizations. Pilot study is important to improve the questionnaires (Neuman, Edwards, & Raju, 1989). Pilot study was conducted to identify weaknesses in design of research instrument. It provides proxy data for selection of probability sample. As per Wiersema and Bird (1993), misleading, ambiguities and useless items must be identified through pilot study. Schindler & Cooper, (2001) state that 25 to 100 respondents are appropriate for pilot study. Out of 25 respondents involved in pilot study, 5 were quality managers, 5 from supervisory staff members and 15 were from Kaizen team leaders /

members. The respondents selected for survey were experienced and have the ability to transform an organization into a learning organization. The respondents were asked about relevance of the questions. They were also given a chance to comment on the clarity of the instrument. The purpose behind this was to guess time taken by the respondents to complete survey questionnaires and to identify ambiguity, unclear and difficult to survey question. The result shows that questionnaire takes not more than 25 to 30 minutes to complete it. Preliminary analysis of test data was carried out to make sure that data collected can easily be used to answer the research question and to clarify the contents of the questionnaires. They were asked to give suggestions to improve the questionnaire after reading each question.

All questions having ambiguity and irrelevance to achieve the objective as pointed out by the respondents were deleted from the questionnaire. Six different items were deleted from different variables given in questionnaire during pilot study. The remaining 73 survey scale items included in the final survey questionnaire were declared appropriate by majority of the respondents. The instrument was retranslated from the final Urdu version back into English version by the same translator. The researcher was confident to use this instrument for large scale survey of the organization to collect the data for confirmation of hypotheses. The final version of survey questionnaire is given at the end of this research study as Annexure B to C.

3.7 Measure of Perceptions of Respondents

The perception of top management, middle management and shop floor workers regarding effect of selected variables on effective implementation of Kaizen and its outcome was measured. The Urdu version of instrument was also provided to the respondents on their request.

The data was collected from three main categories of respondents including top management, middle management acting as facilitators and shop floor workers of the organizations who have worked as Kaizen team members or as team leaders. Top management and facilitators not only facilitate the Kaizen team in planning Kaizen event but also provide guidance to the shop floor worker working as Kaizen team members.

Facilitators were from middle management of administrative/ technical staff of the organizations. They can exercise their authority to facilitate the Kaizen team. Although the facilitators were not the part of Kaizen team but they always deliver training and guidance regarding use of different Kaizen tools to solve the selected problems, carry out discussion with

team members to remain on the track. Top management also remained involved in Kaizen activities by ensuring provisioning of resources to Kaizen team members in the form of equipment, meeting space, and approval from Chief Executive Officer (CEO). Workers at shop floor formulate their team and carry out discussion to find out different options regarding solution of the selected problem. The team members also select their team leader who carryout liaison with team facilitator and helps out the Kaizen team members in problem solving.

Both qualitative and quantitative data, in the form of organizational demography and measure of perception of respondents on different factors related to Kaizen was gathered to test the hypotheses. Perception of employees of the organization measured through operationalized measures developed for different independent, process and outcome factors of Kaizen. Detail of these developed operationalized measures is given in succeeding paragraph.

3.7.1 **Operationalized Measures for Outcome Variables of Kaizen**

Survey scale items are developed for measuring perceptions of respondents related to outcome factors of Kaizen such as human resource development, work area improvement, organizational internal process improvement, products quality improvement and overall success of Kaizen are given in Table 3.1. The perception of management, supervisory staff and shop floor workers regarding these outcome variables has been measured in the form of Likert Scale ranging from 1 to 5 whereas1indicates strongly disagree, 2indicates disagree, 3 indicates neutral, 4 indicates agree and 5 indicates strongly agree with the statement of the survey scale. The detail of survey scale items used to measure the perception of respondent regarding Outcome or Dependent Variable of Kaizen is given as follows:

Table 3.1: Operationalized Measures for outcomes or DVs of Kaizen

Variables	Input Data	Survey Instruments	Data Source
Outcome or DVs of Kaizen			
Human Resource Development (HRD)	Four items survey scale based on HRD, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: HRD1 In general, Kaizen activities motivated the	Circulation of survey questionnaire	Production / Quality Managers, Supervisor / Kaizen team leaders and

	team members in your organization. HRD2 Technical knowledge of the Kaizen event participant is more as compared to other employees of the organization. HRD3 Kaizen team members' skill level is enhanced after each Kaizen event in your organization. HRD4 Team member's interest in Kaizen activities increases after each Kaizen event.		team members
Work Area Improvement (WAI)	Four items survey scale based on WAI, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: WAI1 In your organization, work area has been improved due to Kaizen activities. WAI2 Overall achieving Kaizen goals have improved work area efficiency of your organization. WAI3 Lot of space has been made available for work, through Kaizen activities in your organization. WAI4 In your organization all work area is neat and clean due to Kaizen implementation.	Circulation of survey questionnaire	Production / Quality Managers, Supervisor/ Kaizen team leaders and team members
Organization Internal Process Improvement (OIPI)	Five items survey scale based on OIPI, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: IPI 1 100% of units produced/ service provided in your organization are accepted by the customers.	Circulation of survey questionnaire	Production / Quality Managers, Supervisor/ Kaizen team leaders and team members

	IPI 2 The primary product of your organization is reliable and durable IPI 3 In your organizations internal processes have been improved a lot due to Kaizen activities. IPI 4 In your organization, internal process improved due to Kaizen implementation. IPI 5 In your organization, line workers are encouraged to fix the problems they feel in the process through Kaizen activities.		
Products Quality Improvement (PQI)	Five items survey scale based on PQI, developed by modifying scale used by (Farris, 2006) measured using 5 point Likert response scale to measure the perception of individual respondents: PQI 1 The customers are satisfied with the performance of your organization's primary product. PQI 2 In your organization manufactured products/ service provided need no rework PQI 3 Your organization's products/ services are in conformance to customer's requirement. PQI 4 Quality of your organization's products has been improved a lot due to Kaizen activities. PQI 5 Kaizen activities have reduced rejection rate of your organization's products/ services.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members
Overall Success of Kaizen (OSK)	Five items survey scale based on OSK, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: OSK1 Overall Kaizen is perceived as success in your organization.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	OSK2 Benefit/ outcomes of Kaizen are sustainable in your organization. OSK3 Stakeholders are satisfied with your organization's performance. OSK4 Overall Kaizen activities have achieved their goals set by your organization. OSK5 Higher customer's satisfaction is being achieved through Kaizen activities in your organization.		

3.7.2 **Operationalized Measures for Process Factors of Kaizen**

The perception of respondents from management, supervisory staff and shop floor workers regarding process variables of Kaizen implementation in the form of Employee's Commitment to Kaizen, Action Oriented Kaizen, Employee's Knowledge about Kaizen Tools and Techniques and Standardization of Organizational Internal Process were measured through survey scale items. Table 3.2 shows the operationalized measures used for measuring the perception of respondents regarding process variables of Kaizen along with survey instruments and data source.

Table 3.2: Operationalized Measures for PVs of Kaizen Implementations

Variables	Input Data	Survey Instruments	Data Source
Employee's Commitment to Kaizen (ECK)	Five items survey scale based on ECK, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: ECK1 In your organization, employees are committed to Kaizen activities. ECK2 In your organization, employees think that Kaizen is a good strategy for	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	improvement. ECK3 In your organization, employees think that holding Kaizen activities is good for organizational performance improvement. ECK4 In your organization, employees are of the opinion that Kaizen will serve an important purpose of organization performance improvement. ECK5 In your organization, employees believe that Kaizen is necessary for continuous improvement of the organization.		
Action Oriented Kaizen (AOK)	Five items survey scale based on AOK, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents: AOK 1In your organization, employees participating in Kaizen activities, spent most of their time in work area. AOK 2In your organization, employees participating in Kaizen activities spent very short time in meeting rooms. AOK3 In your organization, employees participating in Kaizen activities are fully supported by facilitator. AOK4 In your organization, Kaizen team spends lot of time in discussing improvement ideas before trying them out in the work area. AOK5 In your organization, Kaizen team member's ideas regarding improvement	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	are selected as Kaizen event.		
Expertise on Kaizen Tools & Techniques (EKTT)	Five items survey scale based on EKTT, developed by modifying scale used by (Farris, 2006), measured using a 5 point Likert response scale to measure the perception of individual respondents: EKTT1 In your organization, Kaizen team members have enough experience of Kaizen events. EKTT2 In your organization, employees have much knowledge & training on Kaizen tools & techniques. EKTT3 In your organization, employees have better understanding of Kaizen tools and techniques. EKTT4 In your organization, employee's participating in Kaizen activities are expert in use of 7QC tools. EKTT5 In your organization employees understanding and awareness level about Kaizen is enough.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members
Standardization of Organizational Internal Processes (SOIP)	Five items survey scale based on SOIP, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents: SOIP1 In your organization, internal processes are standardized. SOIP2 In your organization, proper standards exist for each process to measure improvement through Kaizen.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	SOIP3 In your organization, standards are continuously improved through Kaizen. SOIP4 In your organization current methods are regularly analyzed for improvement and standardization. SOIP5 In your organization, standardization of internal process affect the Kaizen outcomes.		

3.7.3 **Operationalized Measures for Input Factors of Kaizen**

The perception of respondents from management, supervisory staff and shop floor workers regarding independent variables of effective implementation of Kaizen was measured in the form of Likert response scale 1-5 against survey scale items. The survey scale items related to independent variables in the form of top management commitment to Kaizen, organization Kaizen culture, personal initiative of employees, rewards and recognition given to employees on their achievement through kaizen, training of worker and Kaizen event and team design were developed. Table 3.3 shows the operationalized measures for independent variables of Kaizen along with survey instruments and data source.

Table 3.3: Operationalized Measures for Input Factor of Kaizen.

Variables	Input Data	Survey Instruments	Data Source
Top Management Commitment (TMC)	Five items survey scale based on TMC, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents: TMC1 In your organization, top management thinks Kaizen is important for continuous improvement of organization. TMC2 In your organization, top management thinks quality is more important than production schedule.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	TMC3 In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality in production. TMC4 In your organization, top level management allocates enough resources for Kaizen activities. TMC5 In your organization, during company level meetings, management discusses the importance of Kaizen.		
Organization Kaizen Culture (OKC)	Five items survey scale based on OKC, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: OKC1 In your organization, employee's participation and discussion in Kaizen activity is open. OKC2 In your organization, employees are empowered to act and communicate results of Kaizen. OKC3 In your organization, employee's concerned ideas are access by the management. OKC4 In your organization, creative problem solving processes exists. OKC5 In your organization, stability & continuity of order exists.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members
Personal Initiative (PI)	Five items survey scale based on PI, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: PI 1 In your organization, Kaizen team has the ability to overcome barriers. PI 2 In your organization, Kaizen team members have shown interest in the Kaizen activities.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team

	PI 3 In your organization, employees are willing to give suggestions for continuous improvement. PI4 In your organization, employees always take initiative to solve the minor problems during routine works. PI 5 In your organization, Kaizen team members respect each other's opinion.		members
Reward & Recognition (RR)	Five items survey scale based on RR, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under:- RR1 In your organization awards are given to individual employees for excellent suggestions. RR 2 In your organization, employees are motivated through rewards and recognition. RR 3 In your organization, effective profit sharing program in the form of bonus exist. RR 4 In your organization, a monthly best worker is nominated in each department. RR 5 In your organization, employee's participation in Kaizen activities are being encouraged and awarded by seniors.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members
Training of workers (TOW)	Five items survey scale based on TOW, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: TOW1 In your organization resources are made available for training of employees. TOW2 In your organization, employees are trained on use of different Kaizen tools & techniques to solve the problem.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	TOW3 In your organization, employees do not view new seminar or program on Kaizen as "Just another fad". TOW4 Your organization trains employees to improve their interactive skills. TOW5 In your organization, employees are encouraged to acquire project management skills to meet deadlines.		
Kaizen Event & Team Design (KETD)	Five items survey scale based on KETD, developed by modifying scale used by (Farris, 2006) measured using a 5 point Likert response scale to measure the perception of individual respondents is given as under: KETD1 In your organization, Kaizen team has enough experience of previous Kaizen activities. KETD2 In your organization, Kaizen team leader is more experienced than other members. KETD3 In your organization, Kaizen team members have been given clear goals. KETD4 Kaizen team members' cross functionality and autonomy have effect on Kaizen success. KETD5 In your organization, Kaizen event planning and design affects the Kaizen outcomes.	Circulation of survey questionnaire	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

3.7.4 **Summary of Survey Questionnaire used for Data Collection**

Summary of survey scale instruments developed to measure the data from surveyed organizations on different operationalized measures as well as the basic demography of the organization is given in Table 3.4. History of Kaizen practices and other quality management techniques being implemented in surveyed organizations were also measured through Phase-I of the survey.

Table 3.4: Summary of Different Parts of Data Collection Tools (Survey Questionnaire)

Instruments	Variable measures	Description of instrument	Source of data Collection
Survey questionnaire (Part I)	Basic organizational demographic data, history of Kaizen program, different TQM/ Kaizen tools & techniques being implemented by the surveyed organization, competency and awareness level of Kaizen tools and techniques among top management, middle management and shop floor workers of the organization, human resource development. Various factors affecting Kaizen and its outcome variables	Location of organization, respondents designation, experience, size, classification of products, competency and awareness level and implementation status of quality management/ Kaizen tools & techniques, overall success of Kaizen in the form of goal achievement, identification of different factors affecting Kaizen implementation and its outcome in an organization.	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members
Survey questionnaire (Part-II)	Factors affecting Kaizen and outcome of effective implementation of Kaizen. a. Top management commitment b. Organizational Kaizen culture c. Personal initiative d. Rewards and recognition e. Training of workers f. Kaizen event & team design g. Employees commitment to Kaizen h. Action oriented Kaizen i. Expertise on Kaizen tools & techniques	73 Items survey questionnaire along with instructional cover page.	Production/ Quality Managers, Supervisor/ Kaizen team leaders and team members

	j. Standardization of organizational internal process k. Human resource development l. Work area improvement m. Internal process improvement n. Products quality improvement o. Overall success of Kaizen		

3.8 Data Collection

3.8.1 Data Sources and Sample Selection

In order to answer the research questions and confirmation of hypotheses, empirical analysis of the quantitative data was required. This data was collected by measuring the perception of respondents from automobile sectors organizations of Pakistan. Data was collected in two phases: In Phase-I, member organizations of PAMA, PAAPAM, APMA and OEM vender companies and automobile service provider organizations from multinational automobile companies were approached to identify a suitable sampling frame for Phase-II of survey.

In Phase-1, total 455 automobile and their parts manufacturing companies and service providing organizations located at different areas including northern, central and southern zones of Pakistan were selected. Almost all the members' organizations of Pakistan Association of Automotive Parts & Accessories Manufacturers (PAAPAM) and Pakistan Automobile Manufacturing Association (PAMA) along with 37 registered dealers of Toyota (Indus Motor Pakistan), 21 from Honda Company and 25 from Suzuki Motor Pakistan located in major cities of Pakistan were approached. Out of these 455 organizations only 216 organizations have responded back (showing response rate 47.5%). Sixteen organizations have responded partially and their response was not included in the final analysis of the data. Out of 216 automobile and their parts manufacturing / service providing organizations, only 106 organizations were found to have some awareness level of implementing TQM / Kaizen tools and techniques for continuous improvement of their internal processes / quality of their product. In Phase-II of the survey, 97 organizations fulfilling the criteria given below were selected to measure perception of respondents against selected operational measures. Main criteria for selection of the

organizations for Phase-II of the survey was that the organizations should be implementing continuous improvement as organizational strategy, using different types of tools and techniques under the umbrella of Kaizen.

The sampling frame for Phase-II of the survey consists of internal customers of these selected organizations of Phase-1 of the survey. Four to five respondents including persons from top management, middle management, quality assurance / quality control department, Kaizen facilitators, Kaizen team leader and team members from 97 selected organizations of Phase-I of the survey were given Part-II of the survey questionnaire. Selected organizations were given briefing on the research requirements and its future benefits for their organizations. In Phase-2 of the survey totals of 450 survey questionnaires were disseminated among 97 selected organizations through e-mail as well as through the circulation of hard copy. A total of 200 responses were eventually received showing the response rate of 44.40%. To reduce the variation among organizations and to develop some basis for comparison, certain conditions were established for the selection of organization for this research. These conditions include following:

a Organizations that manufacture automobiles& their parts and services provide in the automobile sector of Pakistan were selected for this research, so that the organizations have similarities in fundamental processes that are used to measure the performance of the organizations.

b The selected organizations must be using TQM / Kaizen tools & techniques for continuous improvement of its processes / product / services. Organizations, not implementing even a single TQM / Kaizen tool & technique for CI of their organization were eliminated from the list of selected organizations for Phase-2 of survey.

c The selected organizations for Phase-II of the survey must conduct at least 1-2 Kaizen events per year for continuous improvement of its performance.

d General Managers, production managers, quality managers, Kaizen team facilitators, Kaizen team leaders and Kaizen team members of these organizations were selected, to measure their perception regarding the effect of different IV, PV on DV of Kaizen in their organizations.

Automobile sector's organizations of Pakistan are mostly Japan-based and have more chances of implementing TQM/ Kaizen tools & techniques and Toyota production system for continuous improvement of their performance. In order to enhance the sample size, organizations from automobile service sector organizations were also included in the list.

Phase-I of the survey was conducted to check the demography, human resource development, awareness level and implementation status of different quality management/ Kaizen tools and techniques for continuous improvement of automobile sectors organizations of Pakistan. The opinion of respondents from these organizations regarding different key factors affecting Kaizen implementation and its outcome as identified through literature review, was also measured for the confirmation of key factors of Kaizen before conduct of Phase-II of survey. During Phase-II of survey, perceptions of four to five respondents from each of the selected organizations related to effects of key independent variables of Kaizen on its outcomes was measured in the form of quantitative data on Likert scale 1 to 5. Quantitative data collected through Phase-2 of survey was statistically analyzed to confirm the hypotheses.

3.8.2 **Data Collection Process**

Meetings with representative of selected organizations were arranged through official correspondence from Department of Engineering Management NUST College of E&ME and administration of the selected organization. Copy of letter is attached as Annexures A to this research study. In addition to the quantitative data collected through survey questionnaire organizational background information was also gathered from the PAAMA, PAAPAM directory and Kaizen team members log activities. Other information related to participating organizations was also obtained from internet, including company website, business reports and annual report of PAMA and PAAPAM. Detail of data collected through Phase-1 of survey is given as under:

a. Data related to organizational basic demography such as designation of respondents, location of organization, size of organization in terms of no of employees, experience of respondents in the organization and types of products or services being offered.

b. Data related to quality management tools and techniques, awareness level and implementation status of Kaizen. Awareness level and implementation status of

different Kaizen tools and techniques, competency level of management and shop floor workers on quality management tools & techniques, experience of organization related to Kaizen implementation, existence of established Kaizen culture in the organization was collected.

c. Data related to different factors affecting Kaizen implementation and its outcomes in an organization was collected through circulation of survey questionnaire.

To avoid instrumentation error and to facilitate the collection of data from organizations located at different areas of Pakistan standalone procedure was adopted. The selected organization being located at different parts of the country, it was not possible for the researcher to personally administer the survey questionnaire to all respondents of the organizations. Therefore, a self-administered data collection tool was designed. A two-member team thoroughly trained on the survey questionnaire using standard instructions served as a data collection coordinator. In certain organizations respondents were contacted through telephone and survey questionnaire was mailed to get their response. Top and middle management of the selected organizations were contacted on telephone, through e-mails and through official correspondence from Engineering Management Department of NUST College of E & ME. Copy of letter is attached as Annexure A and permission was obtained for the involvement of their organization in this research project.

Participation of the selected organization in the survey was on voluntary basis. No compensation of any form was given to the participant's organizations. The results of the research were allowed to be shared by the participant's organizations. Respondents of selected organizations were allowed to ask questions before participating in the survey. Finally participants were emphasized to give their candid opinion and not include any names or other identified information.

During Phase-I, Part-I of the Survey questionnaires was forwarded to the automobile sector organizations as discussed earlier. Participants were invited to take part in the survey on 5th February, 2013. Initially the response rate was slow. Three weeks later, on 28th Feb 2013 a reminder was sent to all participants along with the telephonic contact between representative of the organizations and the researcher, which led to a peak in response. The Phase-I of the survey was closed after 10 weeks. Part-II of the survey questionnaire was forwarded to select

automobile sectors organizations which were implementing Kaizen tools and techniques for the CI of their process, quality of the products and performance.

200 respondents including 25 from top management, 53 from middle management, 60 from supervisory staff 62 from shop floor workers working as Kaizen team members and Kaizen team leaders from 63 different organizations returned the filled survey questionnaire. Phase-II of the survey was completed in eight weeks.

3.8.3 **Data Screening**

This section gives an overview of data screening and data management procedure. Survey was completed in four and a half months from February, 2013 to June, 2013. Data collected through survey was validated through face validation of survey responses for fatigue and biasness. A hard and soft copy of the final survey instrument was collected from respondents. Data collected through survey was transformed to Excel spread sheet. Data was manually entered into excel sheet and was compiled in a single excel spread sheet to verify accuracy by checking data visually against two aspects.

a. Completeness of all the entries of the survey questionnaire through face validity and screening of data by verification of response showing survey fatigue.
b. The standard deviation was checked against zero value in response of each respondent through descriptive statistics of the data.

Out of 200 responses received, 25 were incomplete and were not included in further research. Similarly survey results showing zero standard deviation in response of the respondent at serial number 83 and 121 of "Appendix A" were excluded from the research. Out of 200 survey responses received, 27 survey responses from nine different organizations were rejected being incomplete or biased. Finally, 173 individual responses from 54 automobile organizations showing response rate of 47% were included in statistical analyses. Hard copies of completed survey questionnaire were stored in a secure location. Electronic data was stored on secured personal computer of the researcher.

Descriptive statistics showing mean, median, mode, standard deviation and standard error of skewness of data was calculated for the initial data screening. Results of descriptive statistics are shown in "Appendix b". The skewness of the data rests within the range of ±1. As per

Carlio (1997), to exclude the use of parametric test for statistical analyses of data standard error of skewness must be out of the range of ±2 value. To examine distribution property of data collected through survey against independent, process and dependent variables of Kaizen implementation, mean, maiden, mode, histogram and normality test were also conducted.

All survey scales items had symmetrical distribution. Minimum and maximum values indicate that respondents were alert enough and using the entire survey scale. Responses were generally negatively skewed; however, values of skewness is not too much that it can deviate from accepted normality range i.e. no value of skewness is greater than or less than ± 1 which suggests that data can be used for parametric test for statistical analysis.

3.9 Validity Measures of Survey Instrument

The validity relates the perception / understanding of individual respondents to specific variable, measured through survey and represents the real picture of the situation. In other words, validity measures what it should actually measure from the respondents. In this research most of the questions were taken from previous studies of Farris, (2006) with certain modifications. Some measures were newly developed and refined specifically for this research study. Face validity indicates that on the surface the question measures the same concept (Sekaran, 2003). The content validity means suitability of the questions related to the concept being measured. It ensures that measures are adequate and represent the concept being studied. As per Nunnally & Bemstein, (1994, p.453) before undertaking factor analyses, variables reliability must be assessed. In factor analyses the construct validity (convergent validity and discernment validity) is assessed through two different stages. At stage one, exploratory factor analyses is performed whereas, at stage two confirmatory factor analysis is carried out. As per Hair et al., (2010, p. 94) factor analysis is the best way to check empirical validity of a construct having more than three scale items. In this research both exploratory factor analyses (EFA) and confirmatory factor analyses (CFA) were performed to test the construct validity of the questionnaires.

3.10 Exploratory Factor Analyses (EFA) of Survey Scale Items

After initial data screening, construct validity of survey scale items was checked through exploratory factor analysis. Factor analyses are necessary to confirm that survey scales items are valid measures of the research variables. To test the goodness of the measure and to ensure valid and reliable survey results, various steps were taken. To measure the construct validity and

reliability different tests were performed. The construct of the questionnaire was tested through both exploratory factor analyses (EFA) and confirmatory factor analyses (CFA). The purpose of factor analyses is to identify small number of themes, dimensions, components or factor underlying a relatively large set of variables (Meyer & Utterback, 1995). Since each item represents a part of a construct, a group of items is required to explain the construct.

Factor analysis deals with items that are correlated. It also explains which items should be under which dimensional variable. It allows only the reasonable and viable variables being used. As per Hair et al., (2007), to conduct the factor analyses minimum five observations of each variable are required. However, Velicer & Fava, (1998) suggest that if more than three factors have loading above 0.6, then sample sizes is not a problem. As per Roy and McCallum (2001), population factor is not affected by sample size and violation of assumptions. Sample size is not important especially with high communalities. As per Kim and Mueller (1978), there should be at least three scale items for each variable having KMO values ≥ 0.5. Factor analyses comprised of two major steps.

a. Extracting the items mean, show those items which contribute to a variable that form a component.
b. Rotating the items which help in interpretation e.g. it identifies simpler and more meaningful factors.

As per Fidell and Tabachnick (2006), rotated matrix is used to improve readability and scientific utility of items. Criteria for significant loading have been discussed by different authors for selection of the relevant items to represent the construct. Significant loading may vary from ± 0.30 to ± 0.9. At ± 0.30, which is minimum level of significance, only 10% explanation of variance is accounted for by the factors. At ± 0.5, the loading is more significant and 25% of variance is accounted for by the factor and 0.70 factor loading explains 50% of the variance accounted for by the factors. As per Fidell and Tabachnick (2006), factor loading 0.71 and above is considered excellent, whereas 0.63 to 0.70 is considered as very good and from 0.45 to 0.63 is considered fair and factor loading of 0.32 is considered poor. Furthermore the loading in excess of 0.71 indicates 50% overlapping variance, factor loading 0.63 indicates 40% overlapping variance and factor loading of 0.55 indicates 30% overlapping variance.

Moreover, to carry out the factor analysis the Bartlett's test of Sphericity must be significant (P values < 0.05). The significant value of Bartlett's test of Sphericity shows the correlation among the items. As per Voss and Blackmon (1998), the Kaiser-Meyer-Olkin value shows sampling adequacy. If the value of Kaiser-Meyer-Olkin is more than 0.5, then sample size is acceptable. Hair, Money and Samouel, (2007), suggest that the factor loading of 0.6 and above as mediocre, 0.5 to 0.6 as miserable and below 0.5 as not acceptable. As per Field and Sinha (2000) factor loading of 0.5 to 0.7 is a mediocre, 0.7 to 0.8 as a good and 0.8 to 0.9 is a superb. In this research study all the values of factor loading of all variables are above 0.7 which is in good acceptable limits.

The scale items of dependent variables, process variables and independent variables were analyzed in two ways. Once all scale items were analyzed at a time through EFA. The result of factor loading, for this type of factor analysis are given in annexure D at the end of the thesis. Secondly, scale items of independent, dependent and process variables were analyzed through EFA separately. This was done because dependent variables were hypothesized to have direct relationship with independent and process variables. There may be some cross-loading between dependent variables, process variables and independent variables of Kaizen implementation. As per Kline (1994), there should be a minimum ratio of 2:1 between number of observations to scale items and the preferred ratio must be closer to 10:1. For this research study, we have a ratio of observations to maximum numbers of items as 6:1 or (173:30) which indicates adequate sample size for the confirmation of research hypothesis.

As per Johnson (1998), principal component analyses is more rigorous than maximum likelihood method. The research hypotheses formulated for this research, correlate different independent and process variables with outcome variables of Kaizen. Therefore, an oblique rotation method along with principal component analyses was chosen for factor analyses (Finch, 2006). An orthogonal rotation method is preferred for those factors which are independent to each other. As perFabrigar, Wegener, MacCallum, and Strahan (1999), if variables are un-correlated, then oblique rotation and orthogonal rotation method will produce similar results. However, previous research has indicated that correlation may exist between independent and dependent variables. Therefore, instead of orthogonal rotation method, oblique rotation method was preferred. In this research, list wise exclusion method was preferred for missing data for each type of factor analyses.

The grouping of survey items was based on established heuristic of extracting a group based on Eigen value greater than 1. During the last stage of factor analyses correlation matrix of survey item was examined to see the level of correlation between items. The results of principal components analyses (PCA) for dimension reduction are shown in Table 3.5 to 3.10. Factor loading greater than 0.5, with cross loading less than 0.3 was considered meaningful. In order to enhance readability of factor loading, values less than 0.1 were suppressed in the table mentioned above. Overall, the result of factor loading supports the construct validity of the survey scale. Details of factor loading of survey scale items for independent, process and dependent/ outcome variables of Kaizen are given in succeeding paragraph.

3.10.1 **Exploratory Factor Analysis of Survey Scale Items related to IV**

The results of exploratory factor analysis for independent variable of Kaizen are shown in table 3.5 and 3.6. The high value of KMO (0.776 > 0.5) indicates adequacy measure of sampling for input variables, required for factor analyses of the data. Moreover, the significant value of Bartlett's test of Sphericity indicates significant correlation among the items to be analyzed.

Table 3.5: Result of KMO & Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.776
Bartlett's Test of Sphericity	Approx. Chi-Square	4580.178
	Degree of freedom	465
	Significance	.000

Results of factor analysis of IVs of Kaizen indicate that all questions related to independent variables were highly loaded on to the intended scale i.e. minimum observed loading was 0.728 with no significance cross loading on other five scales items. There was a maximum cross loading of 0.125. So all the original items related to each independent variable such as top management commitment, organization kaizen culture, personal initiative, rewards & recognition, training of workers, kaizen event & team design were loaded to their intended scale and were retained in the survey questionnaire and no survey item was deleted due to less factor loading or high cross loading for further analysis.

Table 3.6: Results of Exploratory Factor Analyses of Survey Scale Items of IVs of Kaizen

Items of Scales	Component					
	1	2	3	4	5	6
TMC1- In your organization, top level management thinks Kaizen is important for continuous improvement of the organization.		**.835**				
TMC2- In your organization, top level management thinks quality is more important than production schedule.		**.906**				
TMC3- In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of product.		**.887**				
TMC4- In all company level meetings, top level management discusses importance of Kaizen.		**.872**				
TMC5- In your organization, top management is committed to Kaizen activities.		**.856**	.125			
OKC1- In your organization employee's participation and discussion in Kaizen activities is open.				**.795**		
OKC2- In your organization, employees are empowered to act and communicate.				**.851**		
OKC3- In your organization, employees concerned ideas are access by the management.				**.903**		
OKC4- In your organization creative problem solving processes exists.				**.847**		
OKC5- In your organization stability and continuity of orders exist.				**.728**		
PI1- In your organization, Kaizen team has ability to overcome barriers.						**-.787**
PI2- In your organization, Kaizen team members have shown their interest in Kaizen activities.			-.112			**-.897**

PI3- In your organization, employees are willing to give suggestions for CI.						**-.923**
PI4- In your organization, employees always take initiative to solve the minor problems during routine works.						**-.857**
PI5- In your organization, Kaizen team members respects each other's opinion & feelings.						**-.758**
RR1- In your organization, financial awards are given to individual employees for excellent suggestion.					**.798**	
RR2- In your organization, employees are motivated through rewards and recognition.					**.836**	
RR3- In your organization, effective profit sharing program in the form of bonus exists.					**.868**	
RR4- In your organization, monthly best worker is nominated in each department.					**.869**	
RR5- In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.					**.825**	
TOW1- In your organization, resources are made available for training of employees.			**-.851**			
TOW2- In your organization, employees are trained on the use of different Kaizen tools & techniques.			**-.924**			
TOW3- In your organization, employees do not view new seminar or program on Kaizen as "Just another fad".			**-.921**			
TOW4- In your organization, employees are trained to improve interactive skills.			**-.867**			
TOW5- In your organization, employees are encouraged to acquire project management skills to meet deadlines.	.110		**-.796**			

KETD1- In your organization, Kaizen team has enough experience of previous Kaizen activities in the organization.	**.880**					
KETD2- In your organization, Kaizen team leader is more experienced than other members.	**.921**					
KETD3- In your organization, Kaizen team members have been given clear goals.	**.906**					
KETD4- Kaizen team member's cross-functionality and autonomy have effect on Kaizen event success.	**.915**					
KETD5- In your organization, Kaizen event planning and design affects the Kaizen event outcomes.	**.844**			-.120		

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

Rotation converged in 7 iterations.

3.10.2 **Exploratory Factor Analysis of Survey Scale Items related to PV**

The results related to factor analysis of data collected against process variable are shown in Table 3.7 and Table 3.8. The Kaiser-Meyer-Olkin value for process variables is 0.861 > 0.5 which indicates adequate sample size of process variables for factor analyses. Similarly, value of Bartlett's test of Sphericity is also significant showing presence of correlation among survey scale items so factor analyses can be performed on process variables.

Table 3.7: Result of KMO & Bartlett's Test of Sphericity for PVs of Kaizen

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.861
Bartlett's Test of Sphericity	Approx. Chi-Square	2607.656
	Degree of freedom	210
	Significance	.000

Results of factor analyses of PV indicate that four factors have Eigen value more than 1 covering variance up to 60 %. Results of factor loading indicate that the survey items are loaded as theorized and support the construct validity of process variables. The minimum loading

for survey item was 0.721 with cross loading less than 0.1. All items were highly loaded on one scale items. All five items of employee's commitment to Kaizen (ECK) were highly loaded on a single factor having minimum observed loading of 0.728 with cross loading less than 0.1. Similarly all five items of process variable action oriented Kaizen (AOK) were highly loaded on second factor with minimum observed loading of .814 and maximum cross loading of 0.121.

All six items related to employees expertise on Kaizen tools & techniques were heavily loaded on third factor with minimum observed loading of 0.721 with cross loading of .128. Finally, all five items related to standardization of organizational internal process were highly loaded on to fourth factor with minimum observed loading 0.726 with cross loading of 0.103. None of the items has cross loading more than 0.30. Therefore, no item was deleted from the scale and factor loading of process variables support the construct validity of four survey scale items.

Table 3.8: Result of Exploratory Factor Analyses for Survey Scale Items of PVs of Kaizen

Items of Scales	Component			
	1	2	3	4
ECK1- In your organization employees are committed to Kaizen activities.				.728
ECK2- In your organization, employees think that Kaizen is a good strategy for improvement.				.886
ECK3- In your organization, employees think that holding Kaizen activity is good for organizational performance improvement.				.896
ECK4- In your organization, employees are of opinion that Kaizen will serve an important purpose of organization performance improvement				.912
ECK5- In your organization, employees believe that Kaizen is necessary for continuous improvement of performance of the organization.				.776
AOK1- In your organization, employees participating in Kaizen activities spent most of their time in work area.		.860		
AOK2- In your organization, employees participating in Kaizen activities spend very short time in meeting rooms.		.851		.121

AOK3- In your organization, employees participating in Kaizen activity are fully supported by facilitator.		.907		
AOK4- In your organization, Kaizen team spends lot of time in discussing ideas before trying them out in the work area.		.860		
AOK5- In your organization, Kaizen team members' ideas about improvement activities are given importance.		.814		
EKTT1- In your organization, Kaizen team members have enough experience of Kaizen event.	.721			
EKTT2- In your organization, employees have more knowledge about Kaizen tools & techniques.	.794			
EKTT3- In your organization, employees have better understanding of Kaizen tool & techniques.	.793			.128
EKTT4- In your organization, employees participating in Kaizen activities are expert in the use of 7QC tool.	.891			
EKTT5- In your organization, employees understanding and awareness level of Kaizen affects its outcome.	.850			
SOIP1- In your organization, internal processes are standardized		.112	.814	
SOIP2- In your organization, proper standards exist for each process to measure improvement through Kaizen.			.864	
SOIP3- In your organization, standards are continuously improved through Kaizen activities.			.826	
SOIP4- In your organization, current methods are regularly analyzed for improvement and standardizations.			.804	
SOIP5- In your organization, standardization of internal process affects the Kaizen outcomes.	.103		.726	

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

Rotation converged in 8 iterations.

3.10.3 **Exploratory Factor Analyses of Survey Scale Items Related to DV**

The value of Kaiser-Meyer-Olkin measure KMO was 0.763 > 0.5 which shows that the sample size is enough to be used for factor analyses. Value of Bartlett's test of Sphericity for outcome variables is also significant that mean correlation exist among survey scale items. These values are given in Table 3.9 as follow.

Table 3.9: Result of KMO & Bartlett's Test of Sphericity for DV of Kaizen

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.763
Bartlett's Test of Sphericity	Approx. Chi-Square	2961.754
	Degree of freedom	253
	Significance	.000

The results of factor analyses, shown in Table 3.10, indicate that all questions are loaded highly on their intended scale. Cross loading is less than 0.33. The emerged five factor, having Eigen value more than 0.1 explaining total of 71.0 % variance. All four questions related to human resource development (HRD) were highly loaded on to a single factor with minimum observed value of 0.705 and maximum cross loading of 0.172. All four questions related to work area improvement (WAI) were highly loaded on to second factor with minimum observed value of 0.743 and maximum cross loading less than 0.1. All five items of organizational internal process improvement (OIPI) were highly loaded on to a third factor with minimum observed value of 0.717 and maximum cross loading of 0.132. Similarly, all five questions related to product quality improvement were highly loaded on fifth factor with minimum observed value of 0.715 with maximum cross loading of 0.180. Finally, five scale items selected for overall success of Kaizen (OSK) were highly loaded on sixth factor with minimum observed value of 0.747 and maximum cross loading less than 0.1. No survey item related to DV was deleted as result of factor analyses.

Table 3.10: Result of Exploratory Factor Analyses for Survey Scale Items of DVs of Kaizen

Items of Scales	Component				
	1	2	3	4	5
HRD1- In general, Kaizen activities motivates its team members in your organization.		-.126			-.855
HRD2- In your organization, technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.					-.919
HRD3- Team members' skill level enhanced after each Kaizen event in your organization.		.172			-.705
HRD4- Team member's interest in Kaizen activities improved after each Kaizen event.		.173			-.792
WAI1- In your organization, work area has been improved due to Kaizen activities.				.824	
WAI2- Overall achieving Kaizen goals have improved work area efficiency of your organization.				.892	
WAI3- Lot of place has been made available for work through Kaizen activities in your organization.				.784	
WAI4- In your organization, all work area is neat and clean due to Kaizen activities				.743	
OIPI1- 100% units produced provided by your organization are accepted by the customers.	.888				
OIPI2- In your organization manufactured products/ services provided need no rework.	.870				
OIPI3- In your organization, internal processes have been improved a lot due to Kaizen activities.	.924				
OIPI4- Rejection rate of your organizations products/service provided is negligible.	.830				-.132
OIPI5- In your organization, line workers are encouraged to fix the problems they feel.	.717				

PQI1- The customers are satisfied with the performance of your organization's primary product.			-.862	-.180	
PQI2- The reliability and durability of your organization's primary product is 100%.			-.920		
PQI3- Your organization's products are in conformance to customer's requirement.			-.762	.139	
PQI4- Quality of your organization's products has been improved a lot due to Kaizen activities.			-.730		-.119
PQI5- Kaizen activities have reduced the rejection rate of your organizations, product/ service provided.			-.715	.177	-.107
OSK1- Overall Kaizen is perceived as success in your organization.		.747			
OSK2- Benefit/ outcomes of Kaizen are sustainable in your organization.		.791			
OSK3- Stakeholders are satisfied with your organization's performance.		.887			
OSK4- Overall Kaizen activities have achieved their goals set by your organization.		.894			
OSK5- Higher customer's satisfaction is being achieved through Kaizen activities in your organization.		.828			

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

Rotation converged in 5 iterations.

3.11 **Reliability Measurement of Survey Scale Items**

The findings or results are said to be reliable if the same result is obtained by repeating the research again and again. In this research the reliability of the survey scale items was measured through Cronbach's coefficient alpha (α) value. Cronbach's coefficient alpha (α) is a measure of an internal consistency of survey scale items which can be defined as the degree to which items in a given scale are correlated (Cronbach, 1951). It shows how closely related set of

items grouped together. Standardized Cronbach's Coefficient alpha (α) can be calculated through following formula.

$$\alpha = \frac{\mathrm{N.C}}{\mathrm{V} + (\mathrm{N} - 1).\mathrm{C}}$$

Where

N = Numbers of items, and C is the average inter-item covariance among items

V = the average variance Value.

Measuring the reliability through Cronbach's Coefficient alpha (α) value is a common method of estimating the internal consistency of items (Obwegbuzie & Daniel, 2002). Cronbach's Coefficient alpha (α) method is appropriate on instrument which uses Likert scale. Cronbach's Coefficient alpha (α) value of 0.7 to .99 is considered reliable in social science research and shares high internal consistency. The results of Cronbach's Coefficient alpha (α) values of different variables included in instrument used for this research are shown in Table 3.11. The results show high correlation among the items giving more reliability of survey scale items. Therefore, no item is deleted as the result of reliability test of survey scale is satisfactory.

Table 3.11: Results of Reliability Test of all Variables of Interest

Scales	Cronbach's coefficient alpha (α) value	Cronbach's coefficient alpha (α) value if deleted	Mean	Std Dev (σ)	N
Top Management Commitment	**0.921**	0.922	20.21	2.741	5
Organization Kaizen Culture	**0.884**	0.884	20.92	2.343	5
Personal Initiative of Employee	**0.900**	0.900	20.66	2.585	5
Reward and Recognition	**0.895**	0.895	20.40	2.204	5
Training of Workers	**0.923**	0.923	20.18	2.165	5
Kaizen Event & Team Design	**0.933**	0.934	23.44	2.670	5
Employees Commitment to Kaizen	**0.904**	0.905	19.16	2.410	5

Action Oriented Kaizen	**0.917**	0.917	19.45	2.777	5
Employees Expertise on Kaizen Tool & Technique	**0.904**	0.904	23.40	2.986	6
Standardization of Organization Internal Process	**0.875**	0.875	19.75	2.560	5
Human Resource Development	**0.863**	0.866	16.33	1.834	4
Work Area Improvement	**0.839**	0.842	15.82	1.742	4
Organization Internal Process Improvement	**0.904**	0.904	19.39	2.446	5
Product Quality Improvement	**0.874**	0.875	19.67	2.538	5
Overall success of Kaizen	**0.895**	0.894	19.90	2.650	5

3.12 First Order Confirmatory Factor Analyses of Survey Scale Items

First order CFA was performed using maximum likelihood approach in AMOS-22 software to check the convergent validity and construct reliability of each single order construct. The main object of CFA to test fitness and validity of the data in accordance to hypotheses of variable model. Model fitness is tested through common criteria namely comparative fit index (CFI), goodness of fit index (GFI) adjusted goodness of fit index (AGFI) the chi-square goodness of fit CMIN/DF. The root mean square of error approximation (RMSEA) and Tuckes Lweis coefficient index (TLA). The critical value of (CMIN/DF) for model fitness should be 3 to 5 or less. For best fitness of model value of CFI should be 0.95 or 1. Similarly the value of GFI ≥ 0.95 indicate good fitness of model. The value of RMSEA must be ≤ 0.8 for best fitness of model (Hu & Bentler, 1999). As per Karl L. Weensch, (2013) the value of RMR the root mean square residual must be smaller for best fitness of model. Value of RMR is equal to zero indicate perfect model.

3.12.1 **Convergent Validity of Independent Variables TMC**

3.12.1.1 **Factor Loading**

Figure 3.4: Confirmatory Factor Analysis for TMC

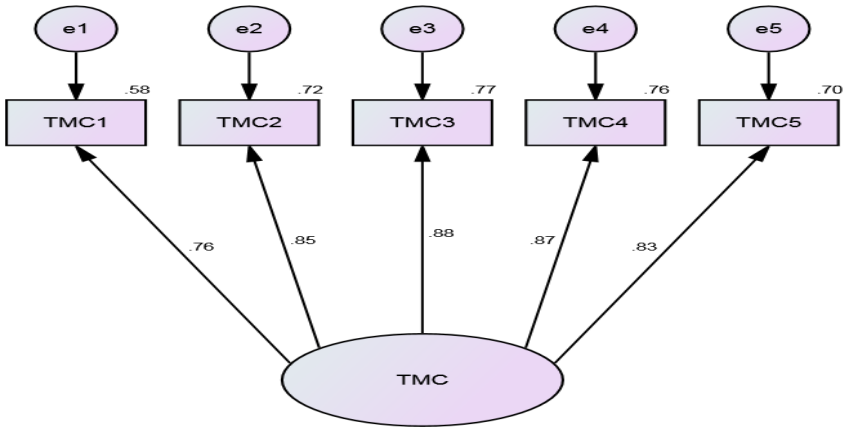


Table 3.12: Factor loading of Survey Scale Items Related to TMC

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, top level management thinks Kaizen is important for continuous improvement of the organization.	0.760	Included
2	In your organization, top level management thinks quality is more important than production schedule.	0.850	Included
3	In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of product.	0.876	Included
4	In all company level meetings, top level management discusses importance of Kaizen.	0.870	Included
5	In your organization, top management is committed to Kaizen activities.	0.834	Included
Sum		**4.19**	**-**

Table 3.12 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to TMC in survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.12 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

Table 3.13: Model fitness index for TMC

Factors	Values	Factors	Values	Factors	Values
CFI	0.932	TLI	0.764	df	5
GFI	0.953	RMSEA	0.038	Chi-square/df	3.15
AGFI	0.859	RMR	.028	CMIN	25.774
p-Value	0.000				

Table 3.13 indicates value structure of CFA of IV TMC. The value of Chi-square/df is 3.15 slightly greater than critical value of 3 which indicate the goodness of fit of TMC model. The value of CFI, GFI, AGFI, TLI, RMSEA and RMR are 0.932, 0.953, 0.859, 0.764, 0.038 and 0.028 respectively. The p-value for TMC model is 0.000 which shows that model is highly significant. The values of the other variables are approximately in similar range

3.12.1.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

MS Excel was used to calculate value of AVE because it cannot be calculated in AMOS- 22. The formula given above shows that AVE is equal to ratio of sum of square of all the factor loadings related to one construct and number of items in that construct. A value of AVE ≥ 0.5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of TMC is given in table 3.14.

Table 3.14: Result of AVE to Determine Convergent Validity of TMC

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, top level management thinks Kaizen is important for continuous improvement of the organization.	0.760	**0.58**
2	In your organization, top level management thinks quality is more important than production schedule.	0.850	**0.72**
3	In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of product.	0.876	**0.77**
4	In all company level meetings, top level management discusses importance of Kaizen.	0.870	**0.76**
5	In your organization, top management is committed to Kaizen activities.	0.834	**0.70**
Sum		**4.19**	**3.52**
AVE			**0.70**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.1.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7. Value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable TMC is given in table 3.15. Since the value of CR is > 0.5 hence CR of variable TMC is confirmed.

Table 3.15: Result of CR of Survey Scale Items Related to TMC

S/No	Items	Factor Loadings (λ ≥0.5)	λ^2	δ=1- Item Reliability
1	In your organization, top level management thinks Kaizen is important for continuous improvement of the organization.	0.760	**0.58**	0.42
2	In your organization, top level management thinks quality is more important than production schedule.	0.850	**0.72**	0.28
3	In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of product.	0.876	**0.77**	0.23
4	In all company level meetings, top level management discusses importance of Kaizen.	0.870	**0.76**	0.24
5	In your organization, top management is committed to Kaizen activities.	0.834	**0.70**	0.30
Sum		**4.19**	**17.56**	**1.48**
			CR	**0.92**

3.12.2 Convergent Validity of Independent Variables OKC

3.12.2.1 **Factor Loading**

Figure 3.5 : Confirmatory Factor Analysis for OKC

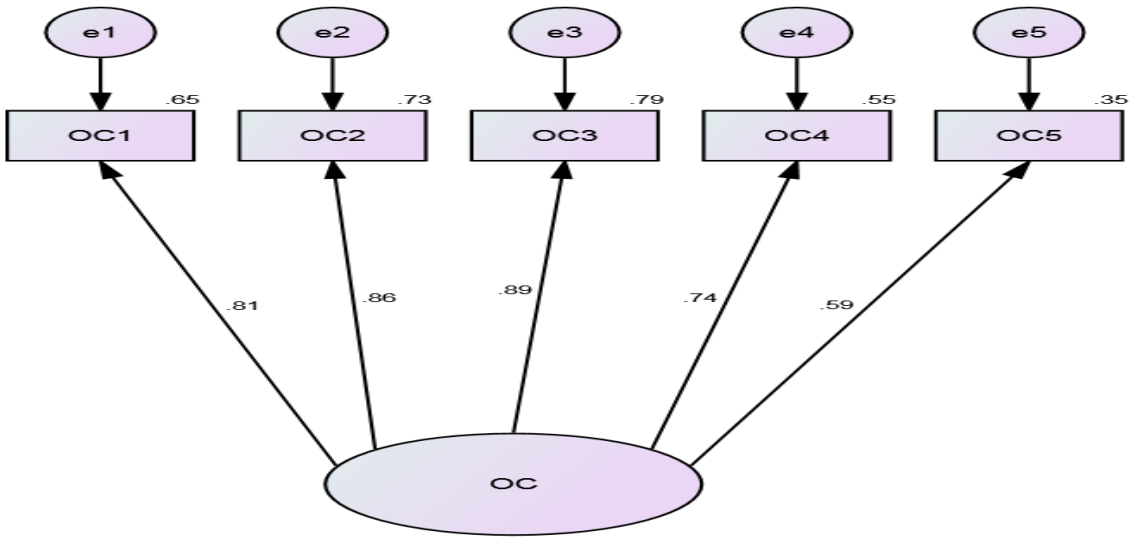


Table 3.16: Factor Loading of Survey Scale Items Related to OKC

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization employee's participation and discussion in Kaizen activities is open.	0.808	Included
2	In your organization, employees are empowered to act and communicate.	0.855	Included
3	In your organization, employee's concerned ideas are access by the management.	0.886	Included
4	In your organization creative problem solving processes exists.	0.740	Included
5	In your organization stability and continuity of orders exist.	0.591	Included
Sum		**3.88**	**-**

Table 3.16 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to OKC in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.16 have factor loading > 0.5. So none of the items was excluded from the questionnaire

3.12.2.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 0.5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of OKC is given in table 3.17.

Table 3.17: Result of AVE to Determine Convergent Validity of OKC

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization employee's participation and discussion in Kaizen activities is open.	0.808	**0.65**
2	In your organization, employees are empowered to act and communicate.	0.855	**0.73**
3	In your organization, employees' concerned ideas are access by the management.	0.886	**0.78**
4	In your organization creative problem solving processes exists.	0.74	**0.55**
5	In your organization stability and continuity of orders exist.	0.591	**0.35**
Sum		**3.88**	**3.07**
AVE			**0.61**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.2.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7.Value of CR between 0.6 and 0.7 is also acceptable if other indicator of models constructs are better. The result of CR of variable OKC is given in table 3.18. Since the value of CR is > 0.5 hence CR of variable OKC is confirmed/ significant.

Table 3.18: Result of CR of Survey Scale Items related to OKC

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization employee's participation and discussion in Kaizen activities is open.	0.808	**0.65**	0.35
2	In your organization, employees are empowered to act and communicate.	0.855	**0.73**	0.27
3	In your organization, employee's concerned ideas are access by the management.	0.886	**0.78**	0.22
4	In your organization creative problem solving processes exists.	0.74	**0.55**	0.45
5	In your organization stability and continuity of orders exist.	0.591	**0.35**	0.65
Sum		**3.88**	**15.05**	**1.93**
			CR	**0.89**

3.12.3 **Convergent Validity of Independent Variables PI**

3.12.3.1 **Factor Loading**

Figure 3.6 : Confirmatory Factor Analysis for PI

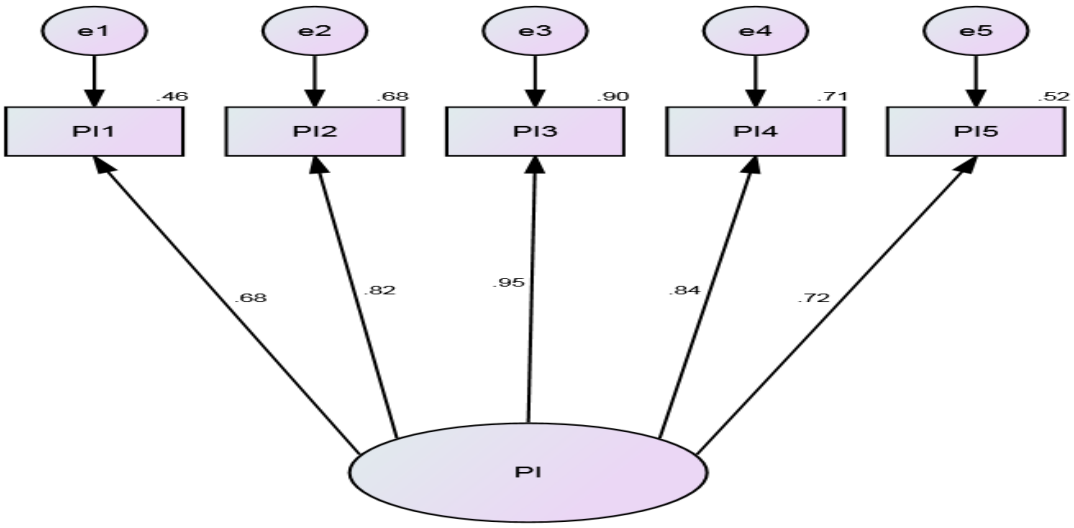


Table 3.19: Factor loading of Survey Scale Items Related to PI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, Kaizen team has ability to overcome barriers.	0.680	Included
2	In your organization, Kaizen team members have shown their interest in Kaizen activities.	0.823	Included
3	In your organization, employees are willing to give suggestions for CI.	0.947	Included
4	In your organization, employees always take initiative to solve the minor problems during routine works.	0.841	Included
5	In your organization, Kaizen team members respects each other's opinion & feelings.	0.724	Included
Sum		**4.02**	**-**

Table 3.19 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to PI in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.19 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

3.12.3.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of PI is given in table 3.20.

Table 3.20: Result of AVE to Determine Convergent Validity of PI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, Kaizen team has ability to overcome barriers.	0.680	**0.46**
2	In your organization, Kaizen team members have shown their interest in Kaizen activities.	0.823	**0.68**
3	In your organization, employees are willing to give suggestions for CI.	0.947	**0.90**
4	In your organization, employees always take initiative to solve the minor problems during routine works.	0.841	**0.71**
5	In your organization, Kaizen team members respects each other's opinion & feelings.	0.724	**0.52**
Sum		**4.02**	**3.27**
AVE			**0.65**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.3.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable PI is given in table 3.21. Since the value of CR is > 0.5 hence CR of variable PI is confirmed/ significant.

Table 3.21: Result of CR of Survey Scale Items Related to PI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, Kaizen team has ability to overcome barriers.	0.680	**0.46**	0.54
2	In your organization, Kaizen team members have shown their interest in Kaizen activities.	0.823	**0.68**	0.32
3	In your organization, employees are willing to give suggestions for CI.	0.947	**0.90**	0.10
4	In your organization, employees always take initiative to solve the minor problems during routine works.	0.841	**0.71**	0.29
5	In your organization, Kaizen team members respects each other's opinion & feelings.	0.724	**0.52**	0.48
Sum		**4.02**	**16.12**	**1.73**
			CR	**0.90**

3.12.4 Convergent Validity of Independent Variables RR

3.12.4.1 **Factor Loading**

Figure 3.7: Confirmatory Factor Analysis for RR

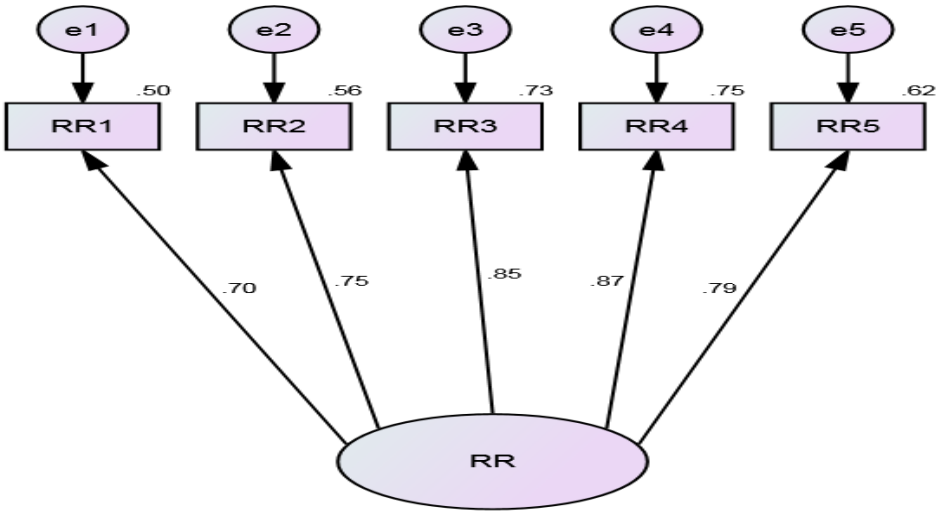


Table 3.22: Factor Loading of survey Scale Items Related to RR

S/No	Items	Factor Loadings (λ ≥0.5)	Decision
1	In your organization, financial awards are given to individual employees for excellent suggestion.	0.704	Included
2	In your organization, employees are motivated through rewards and recognition.	0.749	Included
3	In your organization, effective profit sharing program in the form of bonus exists.	0.854	Included
4	In your organization, monthly best worker is nominated in each department.	0.869	Included
5	In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.	0.790	Included
Sum		**3.97**	**-**

Table 3.22 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to RR in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.22 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.4.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of RR is given in table 3.23.

Table 3.23: Result of AVE to Determine Convergent Validity of RR

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, financial awards are given to individual employees for excellent suggestion.	0.704	**0.50**
2	In your organization, employees are motivated through rewards and recognition.	0.749	**0.56**
3	In your organization, effective profit sharing program in the form of bonus exists.	0.854	**0.73**
4	In your organization, monthly best worker is nominated in each department.	0.869	**0.76**
5	In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.	0.790	**0.62**
Sum		**3.97**	**3.17**
AVE			**0.63**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.4.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The

result of CR of variable RR is given in table 3.24. Since the value of CR is > 0.5 hence CR of variable RR is confirmed/ significant.

Table 3.24: Result of CR of Survey Scale Items Related to RR

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, financial awards are given to individual employees for excellent suggestion.	0.704	**0.50**	0.50
2	In your organization, employees are motivated through rewards and recognition.	0.749	**0.56**	0.44
3	In your organization, effective profit sharing program in the form of bonus exists.	0.854	**0.73**	0.27
4	In your organization, monthly best worker is nominated in each department.	0.869	**0.76**	0.24
5	In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.	0.790	**0.62**	0.38
Sum		**3.97**	**15.73**	**1.83**
			CR	**0.90**

3.12.5 **Convergent Validity of Independent Variables TOW**

3.12.5.1 **Factor Loading**

Figure 3.8: Confirmatory Factor Analysis for TOW

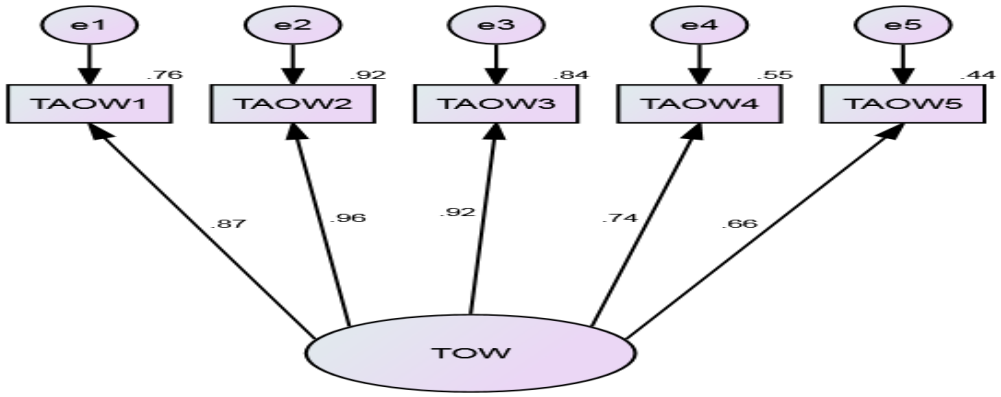


Table 3.25: Factor Loading of Survey Scale Items Related to TOW

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, resources are made available for training of employees.	0.874	Included
2	In your organization, employees are trained on the use of different Kaizen tools & techniques.	0.959	Included
3	In your organization, employees do not view new seminar or program on Kaizen as "Just another fad".	0.916	Included
4	In your organization, employees are trained to improve interactive skills.	0.739	Included
5	In your organization, employees are encouraged to acquire project management skills to meet deadlines.	0.662	Included
Sum		**4.15**	**-**

Table 3.25 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to RR in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.25 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.5.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The results of AVE to find convergent validity of survey scale items TOW is given in table 3.26.

Table 3.26: Result of AVE to Determine Convergent Validity of TOW

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, resources are made available for training of employees.	0.874	**0.76**
2	In your organization, employees are trained on the use of different Kaizen tools & techniques.	0.959	**0.92**
3	In your organization, employees do not view new seminar or program on Kaizen as "Just another fad".	0.916	**0.84**
4	In your organization, employees are trained to improve interactive skills.	0.739	**0.55**
5	In your organization, employees are encouraged to acquire project management skills to meet deadlines.	0.662	**0.44**
Sum		**4.15**	**3.51**
AVE			**0.70**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.5.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and δ = error variances = $1-\lambda^2$ and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable TOW is given in table 3.27. Since the value of CR is > 0.5 hence CR of variable TOW is confirmed/ significant.

Table 3.27: Result of CR of Survey Scale Items Related to TOW

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, financial awards are given to individual employees for excellent suggestion.	0.874	**0.76**	0.24
2	In your organization, employees are motivated through rewards and recognition.	0.959	**0.92**	0.08
3	In your organization, effective profit sharing program in the form of bonus exists.	0.916	**0.84**	0.16
4	In your organization, monthly best worker is nominated in each department.	0.739	**0.55**	0.45
5	In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.	0.662	**0.44**	0.56
Sum		**4.15**	**17.22**	**1.49**
			CR	**0.92**

3.12.6 **Convergent Validity of Independent Variables KETD**

3.12.6.1 **Factor Loading**

Figure 3.9: Confirmatory Factor Analysis for KETD

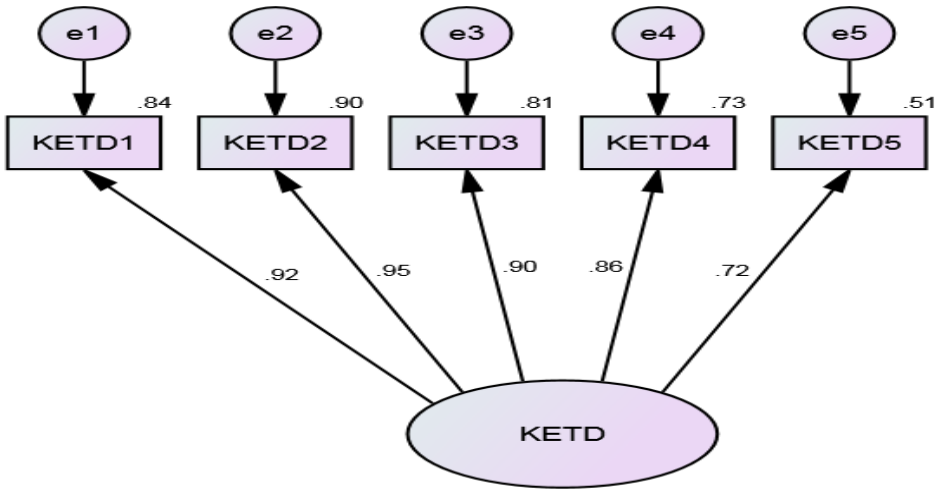


Table 3.28: Factor Loading of Survey Scale Items Related to KETD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, Kaizen team has enough experience of previous Kaizen activities in the organization.	0.915	Included
2	In your organization, Kaizen team leader is more experienced than other members.	0.946	Included
3	In your organization, Kaizen team members have been given clear goals.	0.901	Included
4	Kaizen team member's cross-functionality and autonomy have effect on Kaizen event success.	0.856	Included
5	In your organization, Kaizen event planning and design affects the Kaizen event outcomes.	0.716	Included
Sum		**4.33**	**-**

Table 3.28 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to RR in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.28 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.6.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items is given in table 3.29.

Table 3.29: Result of AVE to Determine Convergent Validity of KETD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, Kaizen team has enough experience of previous Kaizen activities in the organization.	0.915	**0.84**
2	In your organization, Kaizen team leader is more experienced than other members.	0.946	**0.89**
3	In your organization, Kaizen team members have been given clear goals.	0.901	**0.81**
4	Kaizen team member's cross-functionality and autonomy have effect on Kaizen event success.	0.856	**0.73**
5	In your organization, Kaizen event planning and design affects the Kaizen event outcomes.	0.716	**0.51**
Sum		**4.33**	**3.79**
AVE			**0.76**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.6.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = $1-\lambda^2$ and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable KETD is given in table 3.30. Since the value of CR is > 0.5 hence CR of variable KETD is confirmed/ significant.

Table 3.30: Result of CR of Survey Scale Items Related to KETD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, Kaizen team has enough experience of previous Kaizen activities in the organization.	0.915	**0.84**	0.16
2	In your organization, Kaizen team leader is more experienced than other members.	0.946	**0.89**	0.11
3	In your organization, Kaizen team members have been given clear goals.	0.901	**0.81**	0.19
4	Kaizen team member's cross-functionality and autonomy have effect on Kaizen event success.	0.856	**0.73**	0.27
5	In your organization, Kaizen event planning and design affects the Kaizen event outcomes.	0.716	**0.51**	0.49
Sum		**4.33**	**18.78**	**1.21**
			CR	**0.94**

3.12.7 **Convergent Validity of Independent Variables ECK**

3.12.7.1 **Factor Loading**

Figure 3.10: Confirmatory Factor Analysis for ECK

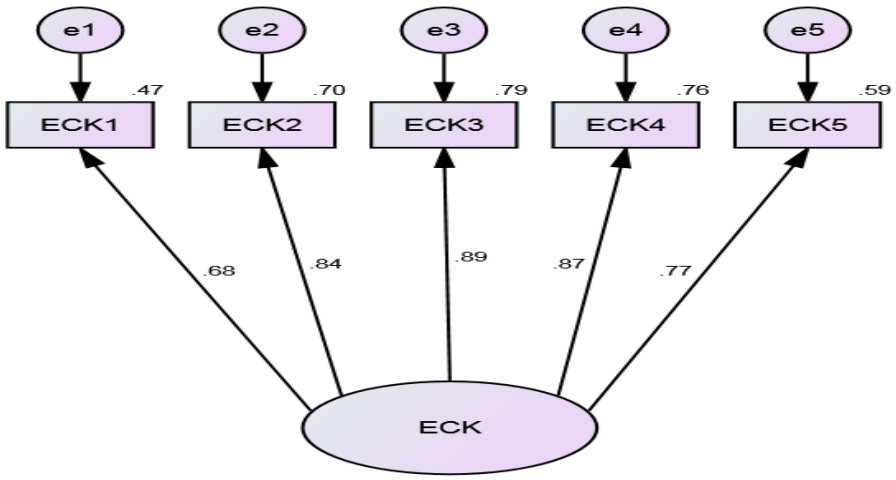


Table 3.31: Factor Loading of Survey Scale Items Related to ECK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization employees are committed to Kaizen activities.	0.684	Included
2	In your organization, employees think that Kaizen is a good strategy for improvement.	0.837	Included
3	In your organization, employees think that holding Kaizen activity is good for organizational performance improvement.	0.887	Included
4	In your organization, employees are of opinion that Kaizen will serve an important purpose of organization performance improvement.	0.870	Included
5	In your organization, employees believe that Kaizen is necessary for continuous improvement of performance of the organization.	0.769	Included
Sum		**4.05**	**-**

Table 3.31 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to ECK in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.31 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.7.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. Result of AVE to find convergent validity of survey scale items of ECK is given in table 3.32.

Table 3.32: Result of AVE to determine Convergent Validity of ECK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization employees are committed to Kaizen activities.	0.684	**0.47**
2	In your organization, employees think that Kaizen is a good strategy for improvement.	0.837	**0.70**
3	In your organization, employees think that holding Kaizen activity is good for organizational performance improvement.	0.887	**0.79**
4	In your organization, employees are of opinion that Kaizen will serve an important purpose of organization performance improvement.	0.870	**0.76**
5	In your organization, employees believe that Kaizen is necessary for continuous improvement of performance of the organization.	0.769	**0.59**
Sum		**4.05**	**3.30**
AVE			**0.66**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.7.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable TOW is given in table 3.33. Since the value of CR is > 0.5 hence CR of variable TOW is confirmed/ significant.

Table 3.33: Result of CR of Survey Scale Items Related to ECK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization employees are committed to Kaizen activities.	0.684	**0.47**	0.53
2	In your organization, employees think that Kaizen is a good strategy for improvement.	0.837	**0.70**	0.30
3	In your organization, employees think that holding Kaizen activity is good for organizational performance improvement.	0.887	**0.79**	0.21
4	In your organization, employees are of opinion that Kaizen will serve an important purpose of organization performance improvement.	0.870	**0.76**	0.24
5	In your organization, employees believe that Kaizen is necessary for continuous improvement of performance of the organization.	0.769	**0.59**	0.41
Sum		**4.05**	**16.38**	**1.70**
			CR	**0.91**

3.12.8 **Convergent Validity of Independent Variables AOK**

3.12.8.1 **Factor Loading**

Figure 3.11: Confirmatory Factor Analysis for AOK

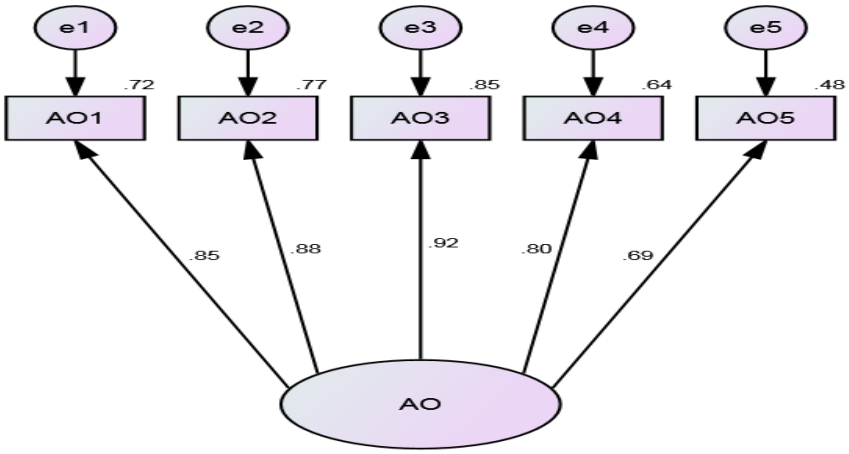


Table 3.34: Factor Loading of Survey Scale Items Related to AOK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, employees participating in Kaizen activities spent most of their time in work area.	0.849	Included
2	In your organization, employees participating in Kaizen activities spend very short time in meeting rooms.	0.879	Included
3	In your organization, employees participating in Kaizen activity are fully supported by facilitator.	0.919	Included
4	In your organization, Kaizen team spends lot of time in discussing ideas before trying them out in the work area.	0.799	Included
5	In your organization, Kaizen team members' ideas about improvement activities are given importance.	0.692	Included
Sum		**4.14**	**-**

Table 3.34 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to AOK in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.34 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.8.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of AOK is given in table 3.35.

Table 3.35: Result of AVE to Determine Convergent Validity of AOK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, employees participating in Kaizen activities spent most of their time in work area.	0.849	**0.72**
2	In your organization, employees participating in Kaizen activities spend very short time in meeting rooms.	0.879	**0.77**
3	In your organization, employees participating in Kaizen activity are fully supported by facilitator.	0.919	**0.84**
4	In your organization, Kaizen team spends lot of time in discussing ideas before trying them out in the work area.	0.799	**0.64**
5	In your organization, Kaizen team members' ideas about improvement activities are given importance.	0.692	**0.48**
Sum		**4.14**	**3.46**
AVE			**0.69**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.8.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = $1-\lambda^2$ and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable AOK is given in table 3.36. Since the value of CR is > 0.5 hence CR of variable AOK is confirmed/ significant.

Table 3.36: Result of CR of Survey Scale Items Related to AOK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, employees participating in Kaizen activities spent most of their time in work area.	0.849	**0.72**	0.28
2	In your organization, employees participating in Kaizen activities spend very short time in meeting rooms.	0.879	**0.77**	0.23
3	In your organization, employees participating in Kaizen activity are fully supported by facilitator.	0.919	**0.84**	0.16
4	In your organization, Kaizen team spends lot of time in discussing ideas before trying them out in the work area.	0.799	**0.64**	0.36
5	In your organization, Kaizen team members' ideas about improvement activities are given importance.	0.692	**0.48**	0.52
Sum		**4.14**	**17.12**	**1.54**
			CR	**0.92**

3.12.9 **Convergent Validity of Independent Variables EKTT**

3.12.9.1 **Factor Loading**

Figure 3.12: Confirmatory Factor Analysis for EKTT

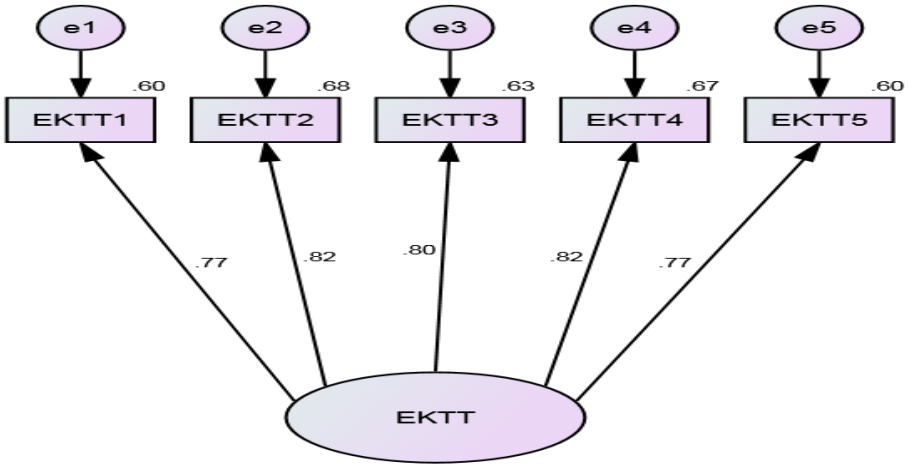


Table 3.37: Factor Loading of Survey Scale Items Related to EKTT

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, Kaizen team members have enough experience of Kaizen event.	0.773	Included
2	In your organization, employees have more knowledge about Kaizen tools & techniques.	0.824	Included
3	In your organization, employees have better understanding of Kaizen tool & techniques.	0.796	Included
4	In your organization, employees participating in Kaizen activities are expert in the use of 7QC tool.	0.816	Included
5	In your organization, employees understanding and awareness level of Kaizen affects its outcome.	0.773	Included
Sum		**3.98**	**-**

Table 3.37 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to EKTT in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.37 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.9.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of EKTT is given in table 3.38.

Table 3.38: Result of AVE to Determine Convergent Validity of EKTT

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, Kaizen team members have enough experience of Kaizen event.	0.773	**0.60**
2	In your organization, employees have more knowledge about Kaizen tools & techniques.	0.824	**0.68**
3	In your organization, employees have better understanding of Kaizen tool & techniques.	0.796	**0.63**
4	In your organization, employees participating in Kaizen activities are expert in the use of 7QC tool.	0.816	**0.67**
5	In your organization, employees understanding and awareness level of Kaizen affects its outcome.	0.773	**0.60**
Sum		**3.98**	**3.17**
AVE			**0.63**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.9.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The

result of CR of variable EKTT is given in table 3.39. Since the value of CR is > 0.5 hence CR of variable EKTT is confirmed/ significant.

Table 3.39: Result of CR of Survey Scale Items Related to EKTT

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, Kaizen team members have enough experience of Kaizen event.	0.773	**0.60**	0.40
2	In your organization, employees have more knowledge about Kaizen tools & techniques.	0.824	**0.68**	0.32
3	In your organization, employees have better understanding of Kaizen tool & techniques.	0.796	**0.63**	0.37
4	In your organization, employees participating in Kaizen activities are expert in the use of 7QC tool.	0.816	**0.67**	0.33
5	In your organization, employees understanding and awareness level of Kaizen affects its outcome.	0.773	**0.60**	0.40
Sum		**3.98**	**15.86**	**1.83**
			CR	**0.90**

3.12.10 **Convergent Validity of Independent Variables SOIP**

3.12.10.1 **Factor Loading**

Figure 3.13: Confirmatory Factor Analysis for SOIP

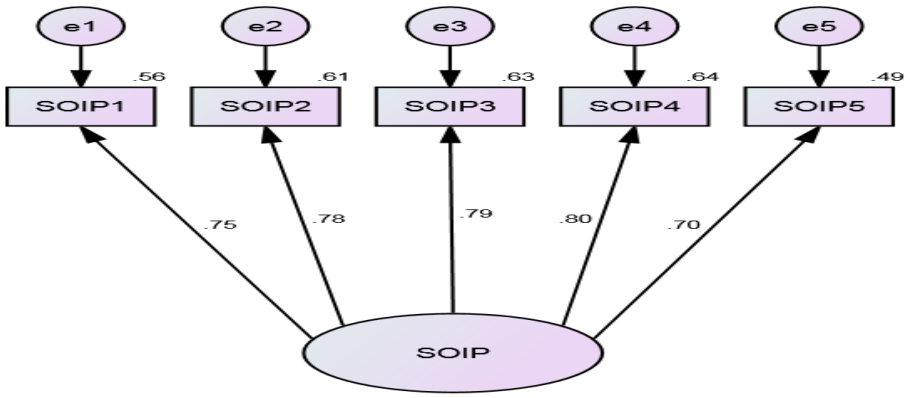


Table 3.40: Factor loading of Survey Scale Items Related to SOIP

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, internal processes are standardized	0.752	Included
2	In your organization, proper standards exist for each process to measure improvement through Kaizen.	0.782	Included
3	In your organization, standards are continuously improved through Kaizen activities.	0.793	Included
4	In your organization, current methods are regularly analyzed for improvement and standardizations.	0.799	Included
5	In your organization, standardization of internal process affects the Kaizen outcomes.	0.697	Included
Sum		**3.82**	**-**

Table 3.40 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to SOIP in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.40 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.10.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of SOIP is given in table 3.41.

Table 3.41: Result of AVE to Determine Convergent Validity of SOIP

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, internal processes are standardized	0.752	**0.57**
2	In your organization, proper standards exist for each process to measure improvement through Kaizen.	0.782	**0.61**
3	In your organization, standards are continuously improved through Kaizen activities.	0.793	**0.63**
4	In your organization, current methods are regularly analyzed for improvement and standardizations.	0.799	**0.64**
5	In your organization, standardization of internal process affects the Kaizen outcomes.	0.697	**0.49**
Sum		**3.82**	**2.93**
AVE			**0.59**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.10.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable SOIP is given in table 3.42. Since the value of CR is > 0.5 hence CR of variable SOIP is confirmed/ significant.

Table 3.42: Result of CR of Survey Scale Items Related to SOIP

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, internal processes are standardized	0.752	**0.57**	0.43
2	In your organization, proper standards exist for each process to measure improvement through Kaizen.	0.782	**0.61**	0.39
3	In your organization, standards are continuously improved through Kaizen activities.	0.793	**0.63**	0.37
4	In your organization, current methods are regularly analyzed for improvement and standardizations.	0.799	**0.64**	0.36
5	In your organization, standardization of internal process affects the Kaizen outcomes.	0.697	**0.49**	0.51
Sum		**3.82**	**14.62**	**2.07**
			CR	**0.88**

3.12.11 **Convergent Validity of Independent Variables HRD**

3.12.11.1 **Factor Loading**

Figure 3.14: Confirmatory Factor Analysis for HRD

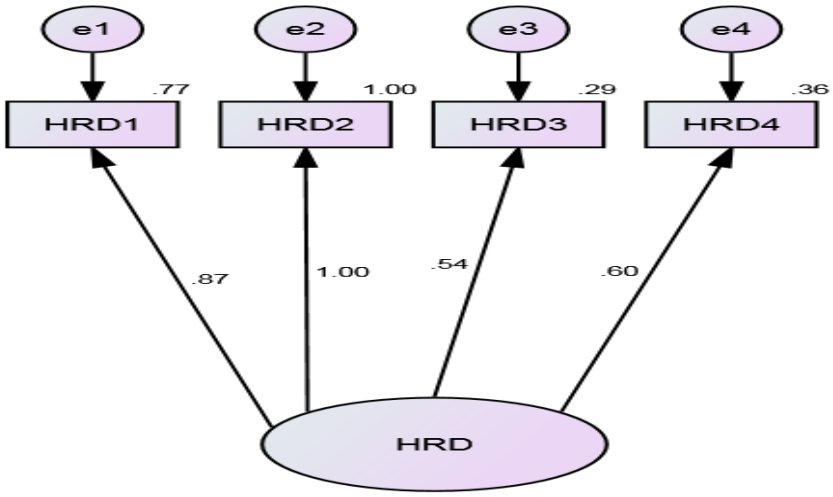


Table 3.43: Factor Loading of Survey Scale Items Related to HRD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In general, Kaizen activities motivates its team members in your organization.	0.875	Included
2	In your organization, technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.	0.975	Included
3	Team members' skill level enhanced after each Kaizen event in your organization.	0.639	Included
4	Team member's interest in Kaizen activities improved after each Kaizen event.	0.600	Included
Sum		**3.09**	**-**

Table 3.43 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to HRD in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.43 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

3.12.11.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of HRD is given in table 3.44.

Table 3.44: Result of AVE to Determine Convergent Validity of HRD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision	λ^2
1	In general, Kaizen activities motivates its team members in your organization.	0.875	Included	**0.77**
2	In your organization, technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.	0.975	Included	**0.95**
3	Team members' skill level enhanced after each Kaizen event in your organization.	0.639	Included	**0.41**
4	Team member's interest in Kaizen activities improved after each Kaizen event.	0.600	Included	**0.36**
Sum		**3.09**	**-**	**2.48**
			AVE	**0.62**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.11.3 Construct Reliability (CR)

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = $1-\lambda^2$ and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable HRD is given in table 3.45. Since the value of CR is > 0.5 hence CR of variable HRD is confirmed/ significant.

Table 3.45: Result of CR of Survey Scale Items Related to HRD

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In general, Kaizen activities motivates its team members in your organization.	0.875	**0.77**	0.23
2	In your organization, technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.	0.975	**0.95**	0.05
3	Team members' skill level enhanced after each Kaizen event in your organization.	0.639	**0.41**	0.59
4	Team member's interest in Kaizen activities improved after each Kaizen event.	0.600	**0.36**	0.64
Sum		**3.09**	**9.54**	**1.52**
			CR	**0.86**

3.12.12 **Convergent Validity of Independent Variables WAI**

3.12.12.1 **Factor Loading**

Figure 3.15: Confirmatory Factor Analysis for WAI

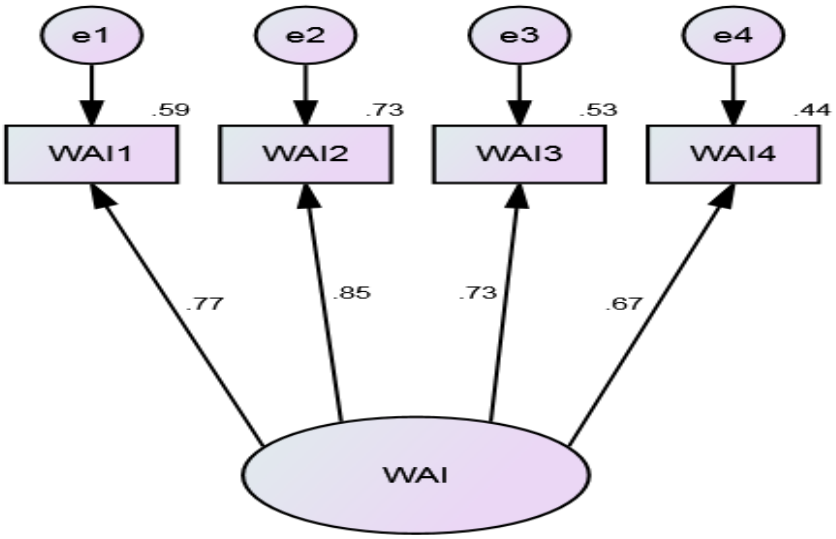


Table 3.46: Factor Loading of Survey Scale Items Related to WAI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	In your organization, work area has been improved due to Kaizen activities.	0.765	Included
2	Overall achieving Kaizen goals have improved work area efficiency of your organization.	0.853	Included
3	Lot of place has been made available for work through Kaizen activities in your organization.	0.725	Included
4	In your organization, all work area is neat and clean due to Kaizen activities	0.667	Included
Sum		**3.01**	**-**

Table 3.46 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to WAI in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.46 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

3.12.12.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of WAI is given in table 3.47.

Table 3.47: Result of AVE to Determine Convergent Validity of WAI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	In your organization, work area has been improved due to Kaizen activities.	0.765	**0.59**
2	Overall achieving Kaizen goals have improved work area efficiency of your organization.	0.853	**0.73**
3	Lot of place has been made available for work through Kaizen activities in your organization.	0.725	**0.53**
4	In your organization, all work area is neat and clean due to Kaizen activities	0.667	**0.44**
Sum		**3.01**	**2.28**
AVE			**0.57**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.12.3 Construct Reliability (CR)

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable WAI is given in table 3.48. Since the value of CR is > 0.5 hence CR of variable WAI is confirmed/ significant.

Table 3.48: Result of CR of Survey Scale Items Related to WAI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	In your organization, work area has been improved due to Kaizen activities.	0.765	**0.59**	0.41
2	Overall achieving Kaizen goals have improved work area efficiency of your organization.	0.853	**0.73**	0.27
3	Lot of place has been made available for work through Kaizen activities in your organization.	0.725	**0.53**	0.47
4	In your organization, all work area is neat and clean due to Kaizen activities	0.667	**0.44**	0.56
Sum		**3.01**	**9.06**	**1.72**
			CR	**0.84**

3.12.13 **Convergent Validity of Independent Variables OIPI**

3.12.13.1 **Factor Loading**

Figure 3.16: Confirmatory Factor Analysis for OIPI

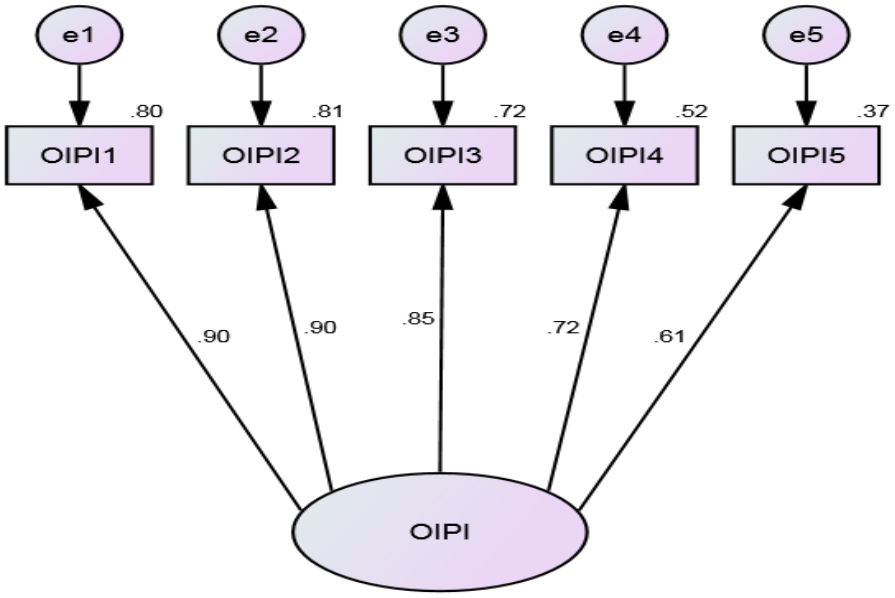


Table 3.49: Factor Loading of Survey Scale Items Related to OIPI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	100% units produced provided by your organization are accepted by the customers.	0.896	Included
2	In your organization manufactured products/ services provided need no rework.	0.898	Included
3	In your organization, internal processes have been improved a lot due to Kaizen activities.	0.850	Included
4	Rejection rate of your organizations products/service provided is negligible.	0.721	Included
5	In your organization, line workers are encouraged to fix the problems they feel.	0.607	Included
Sum		**3.97**	**-**

Table 3.49 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to OIPI in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.49 have factor loading > 0.5. So none of the items was excluded from the questionnaire.

3.12.13.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of scale items of OIPI is given in table 3.50.

Table 3.50: Result of AVE to Determine Convergent Validity of OIPI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	100% units produced provided by your organization are accepted by the customers.	0.896	**0.80**
2	In your organization manufactured products/ services provided need no rework.	0.898	**0.81**
3	In your organization, internal processes have been improved a lot due to Kaizen activities.	0.850	**0.72**
4	Rejection rate of your organizations products/service provided is negligible.	0.721	**0.52**
5	In your organization, line workers are encouraged to fix the problems they feel.	0.607	**0.63**
Sum		**3.97**	**3.22**
AVE			**0.64**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.13.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable OIPI is given in table 3.50. Since the value of CR is > 0.5 hence CR of variable OIPI is confirmed/ significant.

Table 3.51: Result of CR of Survey Scale Items related to OIPI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	100% units produced provided by your organization are accepted by the customers.	0.896	**0.80**	0.20
2	In your organization manufactured products/ services provided need no rework.	0.898	**0.81**	0.19
3	In your organization, internal processes have been improved a lot due to Kaizen activities.	0.850	**0.72**	0.28
4	Rejection rate of your organizations products/service provided is negligible.	0.721	**0.52**	0.48
5	In your organization, line workers are encouraged to fix the problems they feel.	0.607	**0.37**	0.63
Sum		**3.97**	**15.78**	**1.78**
			CR	**0.86**

3.12.14 **Convergent Validity of Independent Variables PQI**

3.12.14.1 **Factor Loading**

Figure 3.17: Confirmatory Factor Analysis for PQI

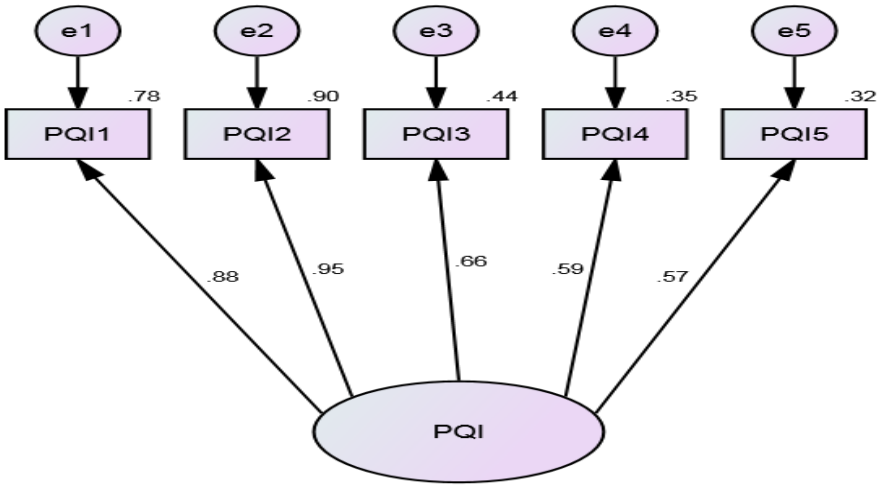


Table 3.52: Factor loading of Survey Scale Items Related to PQI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	The customers are satisfied with the performance of your organization's primary product.	0.884	Included
2	The reliability and durability of your organization's primary product is 100%.	0.947	Included
3	Your organization's products are in conformance to customer's requirement.	0.660	Included
4	Quality of your organization's products has been improved a lot due to Kaizen activities.	0.591	Included
5	Kaizen activities have reduced the rejection rate of your organizations, product/ service provided.	0.568	Included
Sum		**3.65**	**-**

Table 3.52 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to PQI in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.52 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

3.12.14.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of PQI is given in table 3.53.

Table 3.53: Result of AVE to Determine Convergent Validity of PQI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	The customers are satisfied with the performance of your organization's primary product.	0.884	**0.78**
2	The reliability and durability of your organization's primary product is 100%.	0.947	**0.90**
3	Your organization's products are in conformance to customer's requirement.	0.660	**0.44**
4	Quality of your organization's products has been improved a lot due to Kaizen activities.	0.591	**0.35**
5	Kaizen activities have reduced the rejection rate of your organizations, product/ service provided.	0.568	0.68
Sum		**3.65**	**2.79**
AVE			**0.56**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.14.3 **Construct Reliability (CR)**

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = 1- λ^2 and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable PQI is given in table 3.55. Since the value of CR is > 0.5 hence CR of variable PQI is confirmed/ significant.

Table 3.54: Result of CR of Survey Scale Items Related to PQI

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	The customers are satisfied with the performance of your organization's primary product.	0.884	**0.78**	0.22
2	The reliability and durability of your organization's primary product is 100%.	0.947	**0.90**	0.10
3	Your organization's products are in conformance to customer's requirement.	0.660	**0.44**	0.56
4	Quality of your organization's products has been improved a lot due to Kaizen activities.	0.591	**0.35**	0.65
5	Kaizen activities have reduced the rejection rate of your organizations, product/ service provided.	0.568	**0.32**	0.68
Sum		**3.65**	**13.32**	**2.21**
			CR	**0.86**

3.12.15 **Convergent Validity of Independent Variables OSK**

3.12.15.1 **Factor Loading**

Figure 3.18: Confirmatory Factor Analysis for OSK

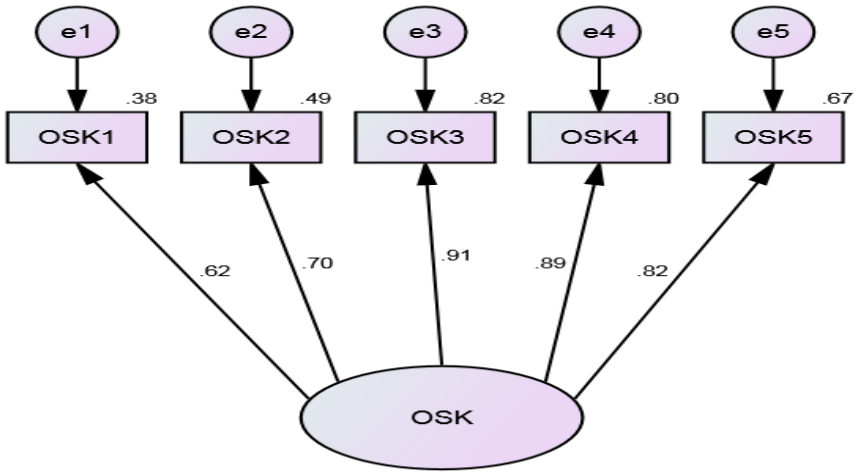


Table 3.55: Factor loading of Survey Scale Items Related to OSK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	Decision
1	Overall Kaizen is perceived as success in your organization.	0.616	Included
2	Benefit/ outcomes of Kaizen are sustainable in your organization.	0.700	Included
3	Stakeholders are satisfied with your organization's performance.	0.905	Included
4	Overall Kaizen activities have achieved their goals set by your organization.	0.895	Included
	Higher customer's satisfaction is being achieved through Kaizen activities in your organization.	0.816	Included
Sum		**3.93**	**-**

Table 3.55 indicate standardized estimate and decision regarding inclusion / exclusion of five survey scale items related to OSK in final survey questionnaire. Construct having factor loading > 0.5 are significant (Cua et al., 2001). All the survey scale items given in table 3.55 have factor loading > 0.5. So none of the items was excluded from the questionnaire for final survey.

3.12.14.2 Average Variance Extracted (AVE)

After confirmation of significant value of factor loading, AVE is calculated through following formula.

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where, λ = standardized factor loading and n = number of items

A value of AVE ≥ 5 is considered adequate for convergent validity of survey scale items. The result of AVE to find convergent validity of survey scale items of PQI is given in table 3.57.

Table 3.56: Result of AVE to Determine Convergent Validity of OSK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2
1	Overall Kaizen is perceived as success in your organization.	0.616	**0.38**
2	Benefit / outcomes of Kaizen are sustainable in your organization.	0.700	**0.49**
3	Stakeholders are satisfied with your organization's performance.	0.905	**0.82**
4	Overall Kaizen activities have achieved their goals set by your organization.	0.895	**0.80**
5	Higher customer's satisfaction is being achieved through Kaizen activities in your organization.	0.816	**0.67**
Sum		**3.93**	**3.16**
AVE			**0.63**

Since value of AVE for all the items is > 0.5 hence convergent validity of items is confirmed

3.12.15.3 Construct Reliability (CR)

To measure the construct validity of survey scale items construct reliability (CR) is calculated. CR are calculated in MS Excel because it is not computable in AMOS-22. The formula used for the computation of CR is given as under

$$\mathbf{CR = (\sum \lambda_1)^2 / [(\sum \lambda_1)^2 + \sum \delta_1]}$$

Where, λ = factor loading and

δ = error variances = $1-\lambda^2$ and λ^2 = item reliability

The critical value for good CR estimate is equal to or greater than 0.7 also value of CR between 0.6 and 0.7 may be acceptable if other indicator of models constructs are better. The result of CR of variable OSK is given in table 3.57. Since the value of CR is > 0.5 hence CR of variable OSK is confirmed/ significant.

Table 3.57: Result of CR of Survey Scale Items Related to OSK

S/No	Items	Factor Loadings ($\lambda \geq 0.5$)	λ^2	δ=1- Item Reliability
1	Overall Kaizen is perceived as success in your organization.	0.616	**0.38**	0.62
2	Benefit/ outcomes of Kaizen are sustainable in your organization.	0.700	**0.49**	0.51
3	Stakeholders are satisfied with your organization's performance.	0.905	**0.82**	0.18
4	Overall Kaizen activities have achieved their goals set by your organization.	0.895	**0.80**	0.20
5	Higher customer's satisfaction is being achieved through Kaizen activities in your organization.	0.816	**0.67**	0.33
Sum		**3.93**	**15.46**	**1.84**
			CR	**0.89**

After Confirmatory Factor Analysis of survey scale items, the final list of independent, process and dependent variables of Kaizen attach as Appendix 'C' was used to collect the data through survey of the respondent from selected organization. Statistical analysis of data collected through survey was carried out to test the hypotheses formulated for this research.

3.13 Formulation of Hypotheses

The purpose of this research was to identify key factors affecting Kaizen implementation in an organization through literature review and to explore the relationships among independent and dependent variables of Kaizen. Framework of strongly correlated variables of Kaizen was required to be developed for its effective implementation in automobile sector of Pakistan. To achieve these objectives, initially each identified independent and process variable of Kaizen was hypothesized to have a direct correlation with each dependent or outcome variable of Kaizen. Then contribution of independent variables in multiple regression model for each outcome

variable of Kaizen was hypothesized. Hypothesis related to mediation effect of process variables between independent variables and overall success of Kaizen in an organization was formulated. The details of specific hypotheses formulated for this research (H1-H5) are given as follows:

Hypothesis # 1: Independent variables of Kaizen such as Top Management Commitment, Organizational Kaizen Culture, Personal Initiative of Employees, Rewards and Recognition given to employees, Training of Workers on Kaizen Tools & Techniques and Kaizen Event & Team Design have direct relationship with each outcome variable of Kaizen such as, HRD, WAI, OIPI, PQI and OSK.

Different sub hypotheses from hypotheses one are given in Table 3.58.

Table 3.58: List of Sub Hypotheses (H1a to H1dd) Derived from Main Hypothesis #1

H1a	Top management commitment to Kaizen has direct relationship with human resource development.
H1b	Top management commitment to Kaizen has direct relationship with work area improvement.
H1c	Top management commitment to Kaizen has direct relationship with organizational internal process improvement.
H1d	Top management commitment to Kaizen has direct relationship with product quality improvement.
H1e	Top management commitment to Kaizen has direct relationship with overall success of Kaizen.
H1f	Organization Kaizen culture has direct relationship with HRD through Kaizen.
H1g	Organization Kaizen culture has direct relationship with work area improvement.
H1h	Organization Kaizen culture has direct relationship with organization internal process improvement.
H1i	Organization Kaizen culture has direct relationship with product quality improvement.
H1j	Organization Kaizen culture has direct relationship with overall success of Kaizen
H1k	Personal initiative of employees has direct relationship with human resource development through Kaizen.

H1l	Personal initiative of employees has direct relationship with work area improvement.
H1m	Personal initiative of employees has direct relationship with organizational internal process improvement through Kaizen.
H1n	Personal initiative of employees has direct relationship with product quality improvement through Kaizen.
H1o	Personal initiative of employees has direct relationship with overall success of Kaizen.
H1p	Rewards and recognition has direct relationship with human resource development.
H1q	Rewards and recognition has direct relationship with work area improvement
H1r	Rewards and recognition has direct relationship with organizational internal process improvement through Kaizen.
H1s	Rewards and recognition has direct relationship with product quality improvement.
H1t	Rewards and recognition has direct relationship with overall success of Kaizen
H1u	Training of workers has direct relationship with human resource development
H1v	Training of workers has direct relationship with work area improvement through Kaizen.
H1w	Training of workers has direct relationship with organization internal process improvement through Kaizen.
H1x	Training of workers has direct relationship with product quality improvement
H1y	Training of workers has direct relationship with overall success of Kaizen.
H1z	Kaizen event and team design has direct relationship with human resource development.
H1aa	Kaizen event and team design has direct relationship with work area improvement.
H1bb	Kaizen event and team design has direct relationship with organizational internal process improvement through Kaizen.
H1cc	Kaizen event and team design has direct relationship with product quality improvement through Kaizen.
H1dd	Kaizen event and team design has direct relationship with overall success of Kaizen.

Since qualitative data was collected through survey response on Likert scale **1** to 5. Hence Pearson Correlation method will be preferred to test these sub hypotheses given in Table 3.15 above. The schematic view of the sub hypothesis is shown in Figure 3.19.

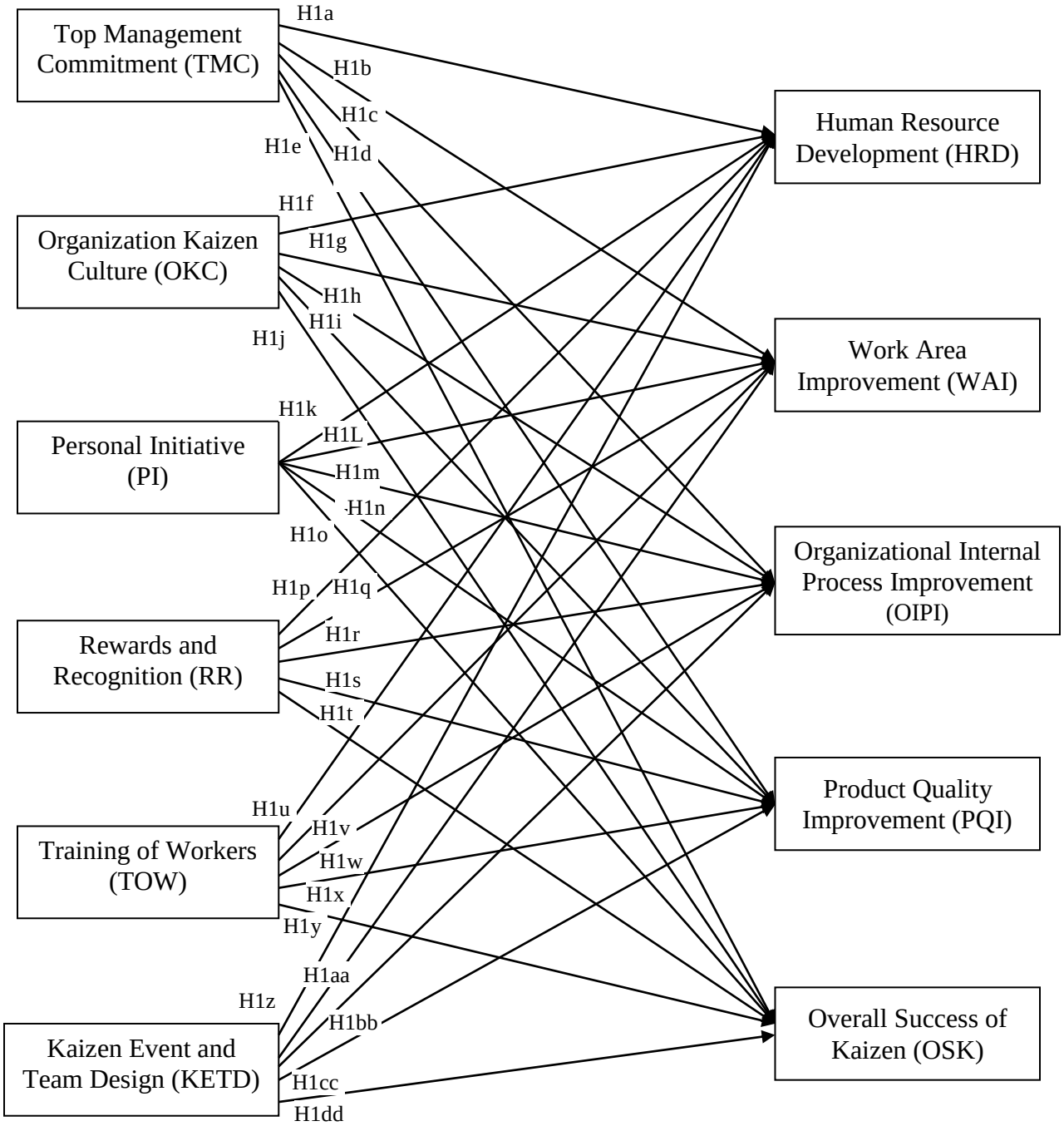


Figure 3.19: Final Set of Sub Hypothesis Derived from Hypothesis #1

Hypothesis # 2: Process variables of Kaizen have direct relationship with each outcome variables of Kaizen such as, HRD, WAI, OIPI, PQI and OSK.

Different sub hypotheses formulated from this main hypothesis are shown in Table 3.59.

Table 3.59: List of Sub Hypotheses Derived from Hypothesis # 2

H2a	Employee's commitment to Kaizen has direct relationship with human resource development through Kaizen.
H2b	Employee's commitment to Kaizen has direct relationship with work area improvement through Kaizen.
H2c	Employee's commitment to Kaizen has direct relationship with organization internal process improvement through Kaizen.
H2d	Employee's commitment to Kaizen has direct relationship with product quality improvement through Kaizen.
H2e	Employee's commitment to Kaizen has direct relationship with overall success of Kaizen.
H2f	Action-oriented Kaizen has direct relationship with human resource development through Kaizen.
H2g	Action-oriented Kaizen has direct relationship with work area improvement through Kaizen.
H2h	Action-oriented Kaizen has direct relationship with organization internal process improvement through Kaizen.
H2i	Action-oriented Kaizen has direct relationship with product quality improvement through Kaizen.
H2j	Action-oriented Kaizen has direct relationship with overall success of Kaizen.
H2k	Employee's knowledge about Kaizen tools and techniques has direct relationship with human resource development through Kaizen.
H2l	Employee's knowledge about Kaizen tools and techniques has direct relationship with work area improvement through Kaizen.
H2m	Employee's knowledge about Kaizen tools and techniques has direct relationship with organization internal process improvement through Kaizen.
H2n	Employee's knowledge about Kaizen tools and techniques has direct relationship with product quality improvement through Kaizen.
H2o	Employee's knowledge about Kaizen tools and techniques has direct relationship with

	overall success of Kaizen.
H2p	Standard organizational internal process has direct relationship with human resource development through Kaizen.
H2q	Standard organizational internal process has direct relationship with work area improvement through Kaizen.
H2r	Standard organizational internal process has direct relationship with DV organization internal process improvement through Kaizen.
H2s	Standard organizational internal process has direct relationship with product quality improvement through Kaizen.
H2t	Standard organizational internal process has direct relationship with overall success of Kaizen.

Schematic view of sub hypothesis formulated for process variables of Kaizen are shown as in Figure 3.20.

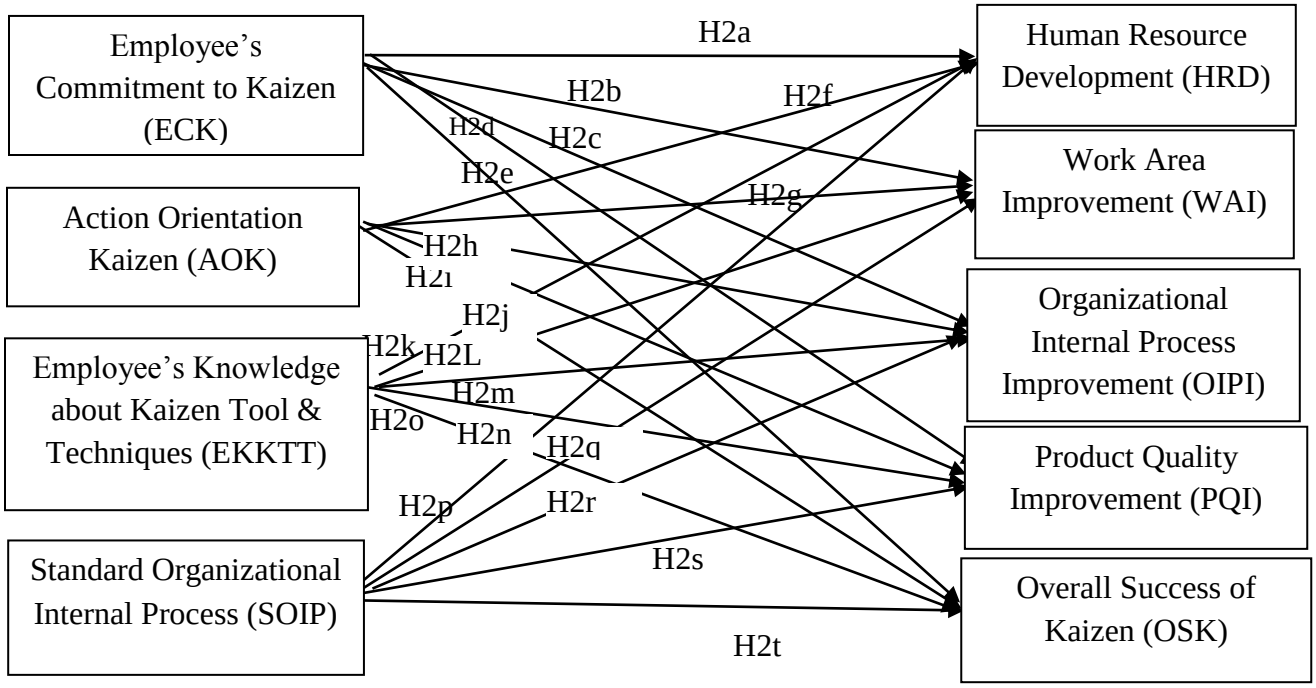


Figure 3.20: Schematic View of Final Set of Sub Hypotheses for PV of Kaizen

Hypotheses # 3a: Human Resource Development (HRD) through Kaizen activities is affected by independent variable of Kaizen i.e. Top Management Commitment, Organizational Kaizen

Culture, Personal Initiative of Employees, Training of Workers and Kaizen Event & Team Design.

Hypotheses # 3b: Work Area Improvement of an organization through Kaizen is affected by independent variables of Kaizen i.e. Top Management Commitment, Organizational Kaizen Culture, Personal Initiative, Training of Workers and Kaizen Event & Team Design.

Hypotheses # 3c: Product Quality Improvement (PQI) of an organization through Kaizen is affected by independent variables of Kaizen i.e. Top Management Commitment, Organizational Kaizen Culture, Personal Initiative, Training of Workers and Kaizen Event & Team Design.

Hypotheses # 3d: Organization Internal Process Improvement (OIPI) through Kaizen is affected by independent variables of Kaizen i.e. Top Management Commitment, Organizational Kaizen Culture, Personal Initiative, Training of Workers and Kaizen Event & Team Design.

Hypotheses # 4: Overall success of Kaizen is affected by independent variables of Kaizen i.e. Top Management Commitment, Organizational Kaizen Culture, Personal Initiative, Training of Workers and Kaizen Event & Team Design.

Hypotheses # 5: Process Variables of Kaizen partially mediates the relationship between independent variables and overall success of Kaizen.

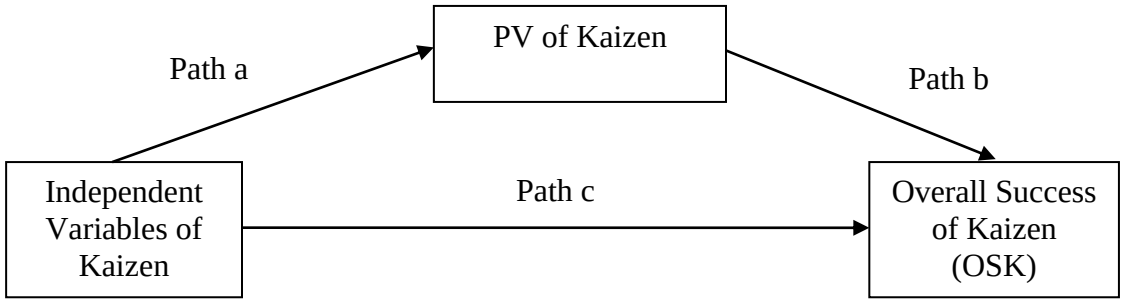


Figure 3.21: Mediation Effect of PVs between IV & OSK

3.14 Hypotheses Testing Techniques

Pearson Correlation Test and Multiple Regression Analyses methods were used to test the hypotheses formulated earlier in Section 3.13. The relationship between each independent and dependent variable as well as each process and dependent variable of Kaizen was identified through Pearson Correlation Test. Since IV, PV and DV were measured in interval scale 1 to 5, therefore according to Sekaran (2003), Pearson Correlation method is the best suitable method

for testing of hypotheses. Hypotheses H3a to H3d and H4 were tested through multiple regression analysis which identifies the effect of more than one independent variable on each dependent variable of Kaizen. The Pearson Correlation value shows strength of association between each independent and dependent variable of Kaizen. Whereas, Multiple Regression Analysis shows maturity level as well as strength of the relationship among the numbers of predictors and each criterion variable by allowing prediction on the strength of the relationship between predictors or IV and criterion or DV of Kaizen. The useful and common method which describes the strength of relationship between two variables is known as Pearson Correlation Coefficient (J. Li, 2011).

The Pearson Correlation Coefficient value between series of "N" measurement of two variables x and y written as x_i and y_i, where i = 1, 2 ….n, is given by equation 3.1

$$r_{xy} = \frac{\sum_{i=1}^{n}(xi-\bar{x})(yi-\bar{y})}{(n-1)oxoy}, \quad (3.1)$$

Where σ_x

$\bar{x}$ Is sample mean of values of *x* variable and$\bar{y}$ is a sample mean of values of y variable.

σ_x is the standard deviation of sample *x* and σ_y is the standard deviation of sample y

Whereas n is the number of pairs of values of variable x and y.

During the hypothesis testing if the correlation coefficient values between sample variables x and y is significant then same value can be inferred as correlation coefficient values between variable x and y at population level. At normal conditions the null hypothesis shows that the Correlation Coefficient value (r) for paired variables x and y of population is equal to zero or less than critical value. Testing of this hypotheses depends on critical value, i.e. p value for each Pearson Correlation test. If the value of p is less than critical value then the correlation between variables is more significant and alternate hypothesis is accepted and null hypothesis is rejected.

3.15 **Data Analyses Techniques**

There are several methods available to analyze the data i.e. parametric test and non-parametric test. Before analyzing, the data was screened and cleaned to check for any ambiguity. The data was screened through descriptive statistics. Although non-parametric test can be applied for the statistical analysis of the data to achieve the research objectives, the results

of descriptive statistics and normality test of data shows that data is approximately normally distributed and skewnes of the data is not significant. Hence, parametric tests were suggested for the analysis of the data and confirmation of the hypotheses. The empirical results achieved through parametric test are more authentic and reliable as compared to non-parametric test results to achieve the research objectives. Out of the several available parametric tests, Pearson correlation tests and multiple regression analysis were selected for this research study.

This research is a field observational correlational study and collection of data was done through survey of selected respondents from selected organizations from automobile sector of Pakistan. Since closed environment cannot be maintained during the research period, experimental and quasi-experimental research methods cannot be applied and thus, correlation method was used to analyze the data. The correlation method is both functionally and structurally different from experimental and quasi-experimental techniques. The correlation studies use measures of association (correlation) to process the relationship between variables within a single group of participants whose responses have not been influenced by the researchers (Dixon, 2000). Two variables are said to be correlated when a systematic relationship exists between them. This implies that as the value of one variable changes, the value of other variable also changes uniformly.

Multiple Regression Analysis method was used to develop a regression model for confirmation of hypotheses H3a to H3d and H4. The mediation effects of process variables of Kaizen between independents variables and overall success of Kaizen in an organization was also confirmed through Multiple Regression Analysis. All the pre-requisites were confirmed before applying Multiple Linear Regression Analysis. The details of the pre-requisites of multiple regression analysis and hierarchical regression analyses are given in chapter five of this research study. The results of qualitative data analysis regarding demography of respondent organizations e.g. the location, type of product development, size based on number of employee and experience of respondents were obtained through data collected in Part-I of the survey. The results are explained in chapter four and five of this research study.

3.16 **Summary**

The research methodology has been outlined in this chapter. Research design, logic of measuring perceptions of respondents, using five point Likert scale have been discussed.

Development of survey instrument for the measurement of perception of respondents from automobile sector organizations has been discussed. Different operationalized measures related to independent, process and dependent variables of Kaizen were formulated to collect the data for confirmation of hypotheses. Data sources and collection procedure was explained. Data screening and data management is highlighted in the next section. The descriptive statistics of the data collected through survey was performed for data screening purpose. Factor Analyses was used to check the validity of the survey scale items. Reliability of instrument was confirmed through calculation of Cronbach's Coefficients alpha (α) value. Research hypotheses are discussed in this chapter and finally, data analyses techniques for the confirmation of the hypotheses were highlighted.

CHAPTER 4: KAIZEN PRACTICES IN AUTOMOBILE SECTOR OF PAKISTAN

4.1 Introduction

Every year the global automobile industry strives hard to improve their production, quality and fuel efficiency of their products without compromising on customer's comfort. In third world countries, there are exist little instances of highly developed infrastructure and technology to deal with indigenous development of automobile sector. Fast growing economies of Asia Pacific region have adopted the quality management techniques to enhance productivity and quality of their products. In this context, regional countries have undergone massive reforms which have facilitated their native industries to compete in the global market (Sarwar, Ishaque, Ehsan, Pirzada, & Nasir, 2011). There is a dire need to implement effective continuous improvement system in automobile sector organizations of developing countries to improve product quality, internal process and to enhance skill level of their shop floor workers (Khan, 2011).

The automobile industry is the sixth largest manufacturing sub-sector in Pakistan. It has shown impressive growth in the last few years with an annual growth rate of above 7%. The automobile sector's annual contribution to GDP amounts to approximately 6 billion US $ (Jalil, 2012). As per Federal Board of Revenue (FBR) report (2014), there was turnover of Rs. 612 billion in automobile sector of Pakistan and its contribution in taxes was Rs. 173 billion. It also generates 215,000 direct job opportunities and contributes US $ 0.82 billion to revenue collection through indirect taxes (CCP, 2013). This sector also contributes 16 percent to the overall manufacturing sector of Pakistan with substantial potential for job creation along with forward and backward linkages in allied industries.

The automobile sector in Pakistan is gradually becoming a key player in economic growth and trade composition. The steady growth in domestic demand for automobiles has allowed Pakistan to become one of the few countries with specialization in the production of all kinds of vehicles including 2 / 3 wheelers, motorcars, LCVs, tractors, prime-movers and trucks. Local manufacturers cater to most of the automotive demand in the country except for a few categories of trucks and prime-movers (Nag, 2014). Despite its rapid growth, quality management techniques have not been implemented effectively in local automobile sector

organizations of Pakistan (Shafiq, 2011). The situation demands analyses of the current quality management practices and CI activities for overall success of Kaizen in automobile sector's organizations of Pakistan.

4.2 History of Pakistan's Automotive Industry

There was no industrial base for local automotive industry in the country at the time of independence and all demands of vehicles were met through imports. Automobile industry of Pakistan started its production in 1950, when Semi Knockdown (SKD) production of Bedford Trucks was started by General Motors. No considerable growth was observed in this sector initially. Development in industries has always gone through phases in accordance to market demand and change in government policies. Government introduced liberalized import policies of Tariff Base System (TBS) in place of Auto Industries Development Program (AIDP) launched earlier in this sector. Pakistan is an emerging market of automobiles and automotive parts with 2% contribution in GDP during 2012. Kaizen practices in Pakistani automotive industry can be understood once history of industry is known which can be divided into four different phases given as under:

4.2.1 Emerging Period (1950 – 1972)

In 1950, with cooperation of General Motor Corporation, National Motors Limited was established as the first automaker which started SKD production of cars and Bedford trucks. Similarly, Rover jeeps and Massey Ferguson tractors started completely knockdown (CKD) production of jeeps and tractors. Emergent need of spare parts resulted in manufacture of automotive parts by small businesses having low levels of technology. Automakers used to import almost all parts and components. Local industry of automotive parts was restricted to develop parts not suitable for import.

4.2.2 Nationalization Period (1972 – 1982)

In 1972, automotive industry was reorganized for the purpose of nationalization under Pakistan Automotive Corporation (PACO). At the end of 1970s PACO discontinued production of vehicles and started production of motorcycle in cooperation with Suzuki Company of Japan. Similarly, spare parts production started under memorandum of understanding (MOU) with state enterprises.

4.2.3 **Partnership with the Private Sector (1983 – 1996)**

In 1980, PACO fostered private companies to produce automobiles along with manufacturing of local parts. Suzuki Motor took initiative and Pak Suzuki Motor was established by PACO for the production of cars, pickups, vans and jeeps in integrated production process. Similar practices were followed by other automobile companies. This resulted in the development of local automotive parts. However the quality of local parts was not of international standards due to constrained attitude of automobile manufacturers towards latest trends.

4.2.4 **Post Privatization (1997 – Present)**

After 1997, the automobile industry entered into a new phase. As a result of privatization, different companies emerged in automobile sector. Suzuki motor has introduced FX 800 cc Suzuki car in the early 80's which, later on, was replaced by Mehran. New models of Khyber and Margalla were introduced but indigenization started in 1997 with building of assembly plant having integrated production lines at Karachi. Pak Suzuki introduced new models of Suzuki Balino and Liana in 2006. Indus Motor Company Ltd was established in 1998 as a joint venture of Toyota Motors, Toyota Daihatsu Corporation and Habib Group. Indus Motor constructed assembly plant at Bin Qasim and started manufacturing Corolla, Hilux and Daihatsu Cuore.

Honda Atlas Pakistan Ltd was established in 1998 by joint venture of Honda Motors. Atlas Group started manufacturing Honda Atlas cars, Honda City and Honda Civic models. Similarly Atlas Honda Ltd (motor cycle) has established assembly plant of motorcycles in 1998 through joint venture of Honda and Atlas Group at Lahore for production of 70cc and 125cc motorcycles. An assembly plant was also established at Karachi in 2006. Other Pakistani top of the line automakers include Ghandhara Nissan Ltd and Dewan Farooq Motors Ltd. Ghandhara Nissan Ltd was established as a result of partnerships between Nissan Motor, Nissan Diesel and Ghandhara. In addition Dewan Farooq Motors Ltd was jointly established by Hyundai Motor, Kia Motors & Dewan Farooq. Important historical events in the development history of automobile industry of Pakistan are given in Table 4.1.

Table 4.1: Important Historical Events in Development of Automobile Industry of Pakistan

1947	Independence of Pakistan	
1950	National Motors Ltd was established and production of automobile in the form of Bedford trucks and passenger cars in the country for commercial purpose was started. During the same period, production of automobile parts also started.	Emerging period
1950s	In 1950 ROVER company started production of Jeeps and Massey Ferguson company stared production of Tractors in the country.	
1960s	Locally manufactured automobile parts production reached up to 20% level of total consumption of parts in automobile sectors.	
1972	PACO was established and all industries were nationalized.	Nationalization period
1970s	Suzuki, Honda and Yamaha companies started production of two wheelers. During this period production of automobile declined with exemption of tractor by Massey Ferguson and other companies.	
1980	Policy of industry nationalization was partially modified and joint project with private companies started solicitation.	
1983	Suzuki Motors was established as joint project with PACO.	Partnership with the private sector
Late 1980s	For the manufacturing of passenger cars, a joint venture started with Honda and Toyota companies. Similarly for the production of truck a joint venture with Nissan, Hino and Mazda companies was started. Production of automobile parts in the country started in 1980.	
1995	Spare parts deletion program was launched in 1995.	
1997	State enterprises were privatized in 1997.	
Post 1997	Pak Suzuki constructed an assembly plant at Bin Qasim and started integrated production. Toyota and Habib Group jointly constructed Bin Qasim plant with name of Indus Motor. Honda and Atlas Group constructed an assembly plant in Lahore by Atlas	After privatization of automobile industry

	Honda (two wheelers).	
2006	Tariff Base System (TBS) was launched in 2006.	
2007	Local parts manufacturing industries were affected negatively due to Tariff Base System (TBS).	
2008	Automobile Industry Development Program was announced.	
2012	Launching of local automobile parts development program through local vendor industries of Pakistan by providing them relief in tariff duty	

4.3 Categories of Pakistan Automobile Industry

According to Ahmed & Batool (2015), there are different segments in Pakistan automobile industries. These segments include Light Commercial Vehicles (LCVs) including cars, two wheelers, three wheelers and four wheelers busses, trucks, tractors and parts manufacturing industries. Automotive parts, assemblies, manufacturers and local vendors are striving to meet the global standards of quality due to lack of technology, quality control and production capacity. Hence, most of the local spare part suppliers cannot supply complex parts that possess high degree of quality. They are divided into Original Equipment Manufacturer (OEM) vendors and after sale parts suppliers.

A recent study carried out by JICA (2013) indicates that in terms of broader categorization of automobile manufacturers, there are approximately 149 to 165 automobile manufacturers producing vehicles such as passenger cars, buses, trucks, two wheelers, rickshaws and tractors in the country. Different types of automobile manufacturer in Pakistan include 10-12 four wheelers, 90-100 two wheelers, 40-45 rickshaws and 5-7 tractor manufacturers (JICA 2013). Out of these 149 manufacturers, only 20 automakers are members of Pakistan Automotive Manufacturers Association (PAMA). Classification of automotive on the basis of engine size reveals that currently there is only a single producer (Pak Suzuki) producing cars in the 800cc engine segment. Production of 1000cc engine cars is also carried out largely by Pak Suzuki. Honda Atlas, Pak Suzuki and Indus Motors (Toyota) compete with each other in the production of 1000cc engine cars (CCP, 2013). Present states of automobile manufacturers from different categories are given as follows.

4.3.1 **Passenger Car Manufacturers**

There are five PAMA members manufacturing passenger cars and jeeps such as Indus Motor, Pak Suzuki, Honda Atlas, Dewan Farooq and Ghandhara Nissan Company. Other automobile manufacturers are not members of PAMA and their production is fairly insignificant. Due to the absence of competing companies, the passenger car market in the country is dominated by only three Japanese automakers, i.e. Pak Suzuki, Indus Motors, and Honda Atlas which boast a combined share of 99.5% in production of cars. Dewan Farooq has already stopped its production in Pakistan.

4.3.2 **Motor Cycle Manufacturers**

The motor cycle market consists of Chinese and Japanese companies which are engaged in severe rivalry. Honda and Suzuki are Japanese companies operating in the country registered with PAMA; whereas out of 60 Chinese companies operating in motorcycles manufacturing business, only 8 companies are registered with PAMA. The remaining Chinese companies are manufacturing motor cycles on limited scale and are not registered with PAMA and they focus on local market only (Sarwar, 2011).

Chinese companies have made a large number of low price motor cycles in 70cc class. They use normally reengineering techniques and assemble motor cycle with low cost Chinese engine and spare parts provided by multiple suppliers. Despite the fact that the quality and safety of Japanese assembled motor cycles is higher than Chinese motor cycles, the costumer buy low cost Chinese motor cycles as compared to Japanese manufactured motor cycles. With wide market size estimated at 30-35 million units, Government has to manage and promote use of international quality standards with locally manufactured parts of two wheelers.

4.3.3 **Rickshaw Manufacturers**

Rickshaws in Pakistan are an alternate means of taxi which is used worldwide as public transport. Its sales vary according to regulations by state government. Initially, most rickshaws were powered by two-stroke engines and were the major source of air pollution and noise, but today rickshaws are shifting to four-stroke CNG / gasoline. In addition to environmental impacts, four-stroke rickshaws offer with better riding comfort and hence they are dominating the market.

Rickshaws engines come in two sizes, 175cc and 200cc, and are mounted on the rear axle according to manufacturer's demand. Usually sales prices are twice that of motor cycles. Most rickshaws are equipped with engines made in China and largely use locally developed spare parts. Rickshaws are assembled from standard module parts and components, resulting in a very low barrier to market entry. As the market is considered to be very stable in terms of demand, some part providers have also started rickshaw production at their own. Out of so many rickshaw producing companies, only Plum Qingqi Motors Ltd, HKF Engineering Pvt Ltd and Sazgar Engineering Works Ltd. are registered with PAMA.

4.3.4 **Bus and Trucks Manufacturers**

There were only five companies manufacturing buses and trucks which are registered with PAMA. These companies are Sigma Motors, Hino Pak Motors, Sindh Engineering Ltd, Ghandhara Industries and Master Motor Corporation of Pakistan. At present Sindh Engineering Ltd does not operate and other four companies are engaged in commercial production. Master Motor Corporation of Pakistan had started as an automotive parts supplier to Pak Suzuki and Indus Motor and is now assembling trucks by using automotive parts and components imported from China (Ahmed, 2015).

Afzal Motors and Bibojee Services are also manufacturing trucks. However, their production is fairly small with 100-150 units per annum in total. Both these companies are not members of PAMA. Only three PAMA member companies make most of trucks and buses in the country. Out of these three companies, Hino Pak and Nissan are Japanese manufacturers and enjoy the most important place. The ten PAMA member companies including five from cars manufacturers hold a combined share of 99.9% of total production of automobile in Pakistan (Ahmed & Batool, 2015).

4.3.5 **Tractor Manufacturers**

The tractor market is controlled by two leading manufacturers, i.e. Al Ghazi and Millat Tractors Ltd, both registered with PAMA. There are non-PAMA members such as Hero Motors and Universal Tractors who are manufacturing tractors relatively small in size and numbers. Thus the two organizations are virtually monopolizing the tractor industry in the country. The tractor manufacturer such as Millet Tractors and Al-Ghazi Company have produced a historical

high numbers of 71,000 units in 2009-2010 using their full capacity. The list of PAMA members is shown in Table 4.2.

Table 4.2: List of the Members of PAMA

S/ No	Name of Companies	Location (City)	Type of Vehicles being Manufactured
1	Pak Suzuki Motor Company Ltd.	Karachi	LCVs, Passenger Cars
2	Hino Pak Motors Ltd.	Karachi	Trucks & Buses
3	DYL Motorcycle Ltd.	Karachi	Two Wheelers
4	Master Motor Corporation Ltd.	Karachi	Truck & Buses
5	Plum Qingqi Motors Ltd.	Lahore	Two & Three Wheelers
6	Ravi Automobile Pvt. Ltd	Karachi	Two Wheelers
7	Indus Motor Company Ltd.	Karachi	LCVs, Passenger Cars
8	Ghandhara Nissan Ltd.	Karachi	Passenger Cars
9	Honda Atlas Cars (Amir & Pakistan) Ltd.	Lahore	LCVs, Passenger Cars
10	Sind Engineering Ltd.	Karachi	Trucks & Buses
11	Dewan Automotive Engineering Ltd.	Karachi	LCVs, Passenger Cars
12	Atlas Honda Ltd.	Karachi	Two Wheelers
13	Fateh Motors Ltd.	Karachi	Two Wheelers
14	Sazgar Engineering Works Ltd.	Lahore	Two and Three Wheelers
15	Sigma Motor (Pvt) Ltd.	Islamabad	Trucks & Buses
16	Ghandhara Industries Ltd.	Karachi	Truck & Buses
17	Millat Tractors Ltd.	Lahore	Tractors
18	Pakistan Cycle Industrial Cooperative Society Ltd.	Lahore	Two Wheelers
19	HKF Engineering Pvt. Ltd.	Lahore	Two and Three Wheelers

4.4 National Traffic Research Centre Report

According to National traffic research center report (2014), the number of vehicles moving on the road are increasing continuously. From 1991 to 2002, the figure increased from 2.1 million to 5 million, whereas in 2008/2009, it reached to 9.4 million, up by 450%. At present, it is getting close to 10 million. A general trend in each type of vehicle is shown in Table 4.3.

Table 4.3: Number of Vehicles on Road in Pakistan

Types of Vehicles / years	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013
800cc&Below1000 cc	65905	28681	37957	46574	59068	47324
1000cc	48495	16149	23330	25287	28888	12785
1300 cc and above	50310	39478	60360	62111	66299	60223
Total cars	164710	84308	121647	133972	154255	120332
LCVs, Vans & Jeeps(4x4)	1590	932	1172	883	451	1475
Farm Tractors	53256	59968	71607	70770	48120	50859
Pickups	21354	16158	15768	19142	20929	14517
Motor Cycles& Three-Wheelers*	641031	493592	736861	838665	828576	819556
Buses	1146	657	628	490	568	522
Trucks	4993	3135	3425	2901	2597	1923
Total Trucks& Buses	6139	3792	4053	3391	3165	2445

* Excluding non-Association members of Pakistan's Motorcycle Assemblers (APMA).

Data Source: (National Traffic Research Center Report, 2014)

4.5 Major Characteristics of Pakistani Automobile Market

The automobile market in Pakistan has three notable features that are discussed here

4.5.1 High Market Share by Japanese Manufacturers

According to the CCP (2013), Japanese companies hold dominant share in automobile market of four wheel and two wheel vehicles. They make up to 99.5% of passenger cars market, 94% of truck market, and 73% of bus market and hold 46% share of two wheelers market in Pakistan (Ahmed & Batool, 2014). In passenger cars, Japanese companies boast 99.5% share; Suzuki and Toyota monopolize the small car segment with 90% and 10% share, while Suzuki enjoys 99% share in the medium-sized segment. The large share in car market is also dominated by Japanese companies Toyota, Honda, and Suzuki. Truck market is dominated by three Japanese manufacturers. Hino accounts for 56%, Nissan 14% and Isuzu 10% of the total market

share. Hino also controls 73% of the bus market. However, since 2008, low-cost buses and trucks have taken share significantly. Up to 2008, in two wheelers market Honda and Suzuki held the market share of 87%; they started losing their monopoly due to Chinese companies but still maintained 46% share up to 2012 (Ahmed & Batool, 2014).

PEDB reports (2013) indicate that most automobile manufacturers in Pakistan have technical collaborations with Japanese automobile firms. In 2012-13, Pakistani companies having collaborations with Japanese companies had the largest share in automobile sales. Table 4.4 indicates that Japanese collaboration is also dominant in the LCV, truck and bus industry.

Table 4.4: Market Share of Local Automobile Companies in Comparison with Japan (2012-13)

Collaboration Type	Car	Motorcycle	Truck	Buses	Tractors	Jeeps	LCVs / Pick Ups
Japanese in (%)	100	44	80	80	0	57	97
Non-Japanese (%)	0	56	20	20	100	43	3

Source: EDB (2013)

Table 4.5: Share of Japanese Companies in Sale Volume of Automotive Sector

S/No	Categories of Automobile	Sales Volume (units: 000)	Japanese Share
1	Passenger Cars	124.0	99.5%
2	Truck	3.6	80.0%
3	Bus	0.7	73.0%
4	Two Wheelers	1,194.0	46.0%

Source: (EDB, 2013)

4.5.2 Customer Base

In Pakistan automobile sector, high income group dominates passenger car market with 49% large cars, whereas small business owners and individuals prefer to go to truck and bus markets. However, in other countries such as India and China, the trend is opposite which results in high growth rate of automobile market (Ahmed & Batool, 2014). Consumer's popularity in Pakistan is concentrated on specific models which again stops the development of competitive market and results in low quality products.

4.5.3. **Popularity on Specific Models**

The third characteristic of the market is consumer popularity on specific models.

Table 4.6 gives further details regarding the installed capacity, turnover and revenue contribution by automobile manufacturers in Pakistan. This table only includes PAMA member companies and excludes members for which data on the indicator mentioned is not available. The omitted categories include motorcycles, rickshaws, trucks and bus manufacturers. Indus Motors Ltd. has the highest turnover. Pak Suzuki Motors, however, has the highest installed capacity per annum (Ahmed & Batool, 2015).

Table 4.6: Specifications of Automobile Manufacturers in Pakistan

Manufacturers	Products	Installed Capacity (Units / annum)	Turnover (Rs million)	Contribution to Exchequer (Rs million)
Pak Suzuki Motor	Cars, LCVs,	150,000	58,531	17,302
Indus Motor.	Cars, LCVs,	54,800	77,000	24,700
Honda Atlas Cars	Cars	50,000	30,275	10,664
Dewan Farooq Motor	Cars, LCVs	20,000	-	8
Sigma Motors Ltd.	Jeeps	1,320	998	236
Hino Pak Motors.	Trucks, Buses	6,000	7,528	650
Ghandhara Nissan Ltd.	Cars, Trucks	8500 (6,000+2,500)	1,624	340
Master Motor Corporation	Trucks, Buses	-	1150	289
Millat Tractors Ltd.	Tractors	-	20,133	1,426
Atlas Honda Ltd.	Motorcycles	750,000	38,011.857	7,700
DYL Motorcycles	Motorcycles	200,000	3,942	722
Ravi Automobile	Motorcycles	75,000	1,027	46
Sazgar Engineering Works	Rickshaws	20,000	2,725.64	605

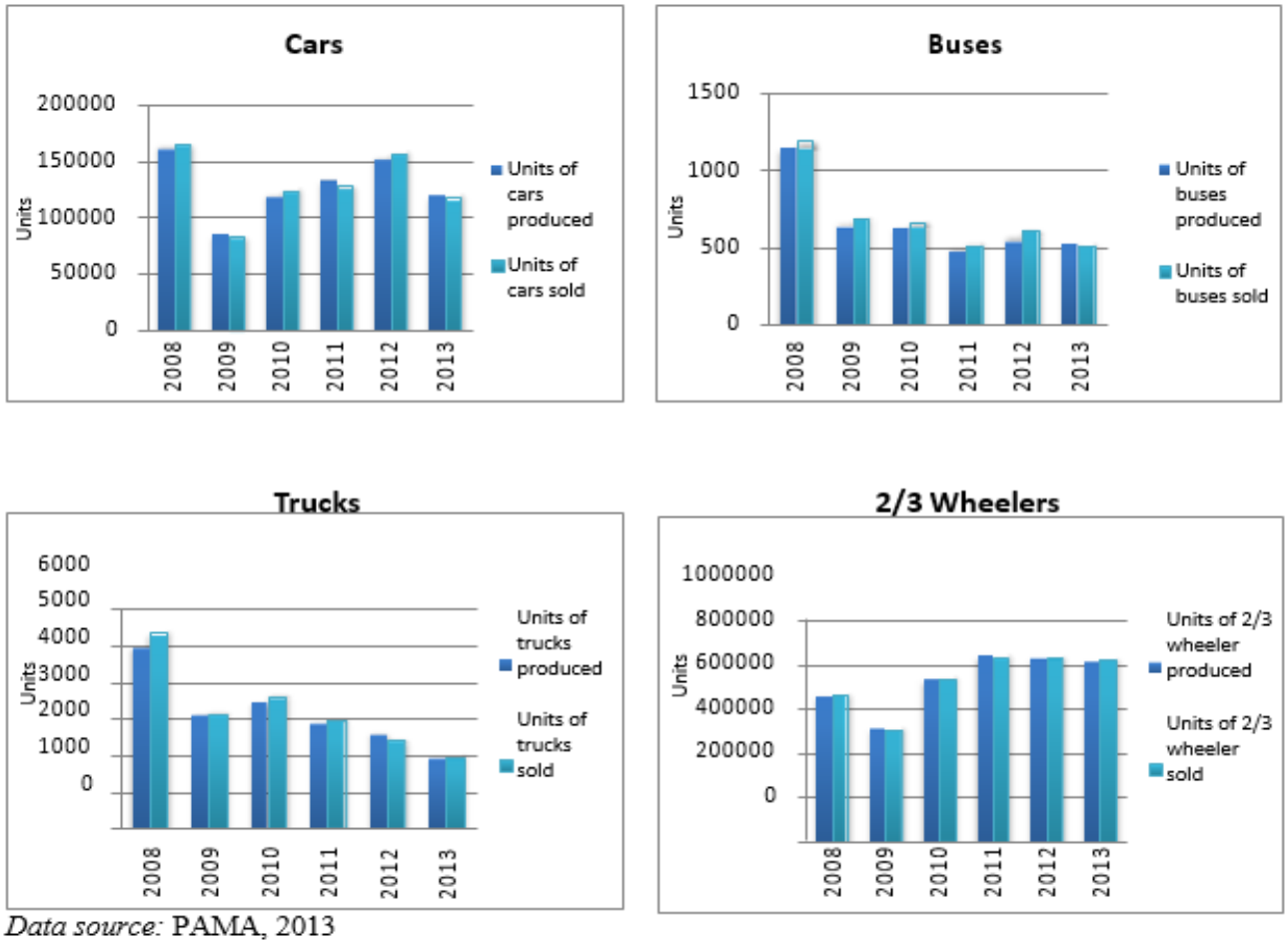
Source: (PAMA, 2013)

Apart from manufacturers, Pakistan has a highly organized automotive vending industry. According to a representative of PAAPAM, there are nearly 670 organized tier-I vending units in Pakistan. Nearly 950 different auto parts are manufactured by the local vending industry. In 2012, auto parts worth US $ 128 million were exported by Pakistan to Germany, Italy, US and to some South Asian countries, particularly Bangladesh. (Ahmed et

al, 2014). The number of organized vendors involved in the auto sector are 250 (JICA, 2013).

4.6 Production Structure of Automobile Industries of Pakistan

Figure 4.1 gives product-wise sales and production of various automobile products. Although the domestic demand for automobiles is met by local manufacturers, in recent years demand has outstripped supply. For example, in year 2010, cars units 121,647 were produced while 123,957 units of cars were sold, pointing towards a demand-supply gap. This gap seems to be more visible in the case of buses and trucks. Automobile import data reveals that the import of trucks and other motor vehicles for the transport of goods forms the second largest category of Pakistan's automobile imports (US$0.2 billion in2012).



Data source: PAMA, 2013

Figure 4.1: Product-wise Sales and Production of Various Automobile Products

Annual production of cars by the top three manufacturers is shown in Figure 4.1a. It is observed that the industry is operating significantly below capacity. One major reason reported

by representatives of PAMA and PAAPAM is the energy crisis in the country. Secondly, the production of small engine cars manufactured by Pak Suzuki Motors has declined in the year 2012-13. The production of Alto, of which 15,288 units were produced in 2011, was discontinued in 2012 by the manufacturer.

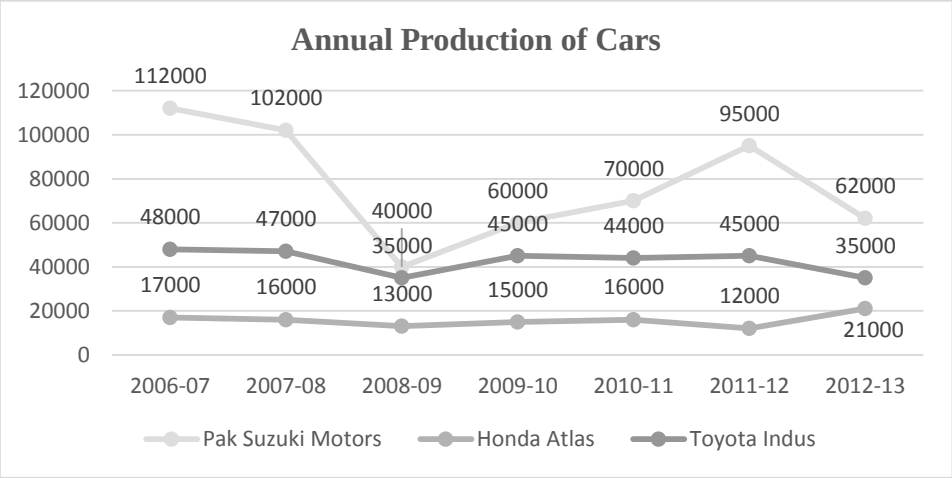


Figure4.1a: Annual Production of Cars

Source: PAMA &Industry via EDB (2013)

4.7 Automobile Trade of Pakistan

Pakistan's exports represent 0.01 percent of world exports while imports represent 0.12 percent of world imports (ITC, 2013). The share of automobile imports in the country's total imports has been rising since 2008 and in 2012 it accounted for 3.6 percent of the country's total imports. On the other hand, the share of automobile exports has remained stagnant at 0.2-0.3 percent of the country's total exports. Afghanistan, Nigeria and Italy were Pakistan's top 3 automobile export destinations in 2013 with shares of 9.5, 9.4 and 7.6 percent respectively. The major countries from which Pakistan imported automobiles during that year were Japan due to its quality products (which accounted for 47.3 percent of total Pakistani automobile imports), Thailand (22 percent of auto imports) and China due to cost effectiveness (11.7 percent of auto imports). Export of CBUs had been volatile until 2010, and began to decline subsequently.

Figure 4.1b indicates that CBU imports have been on the rise since 2009 and peaked at US$1.36 billion in 2012. By contrast, the import of auto parts declined in 2012. This decrease in auto parts can partially be explained by the increased import of used cars in

2011 as a result of an increase in the limit of the age of imported cars during the year 2011.

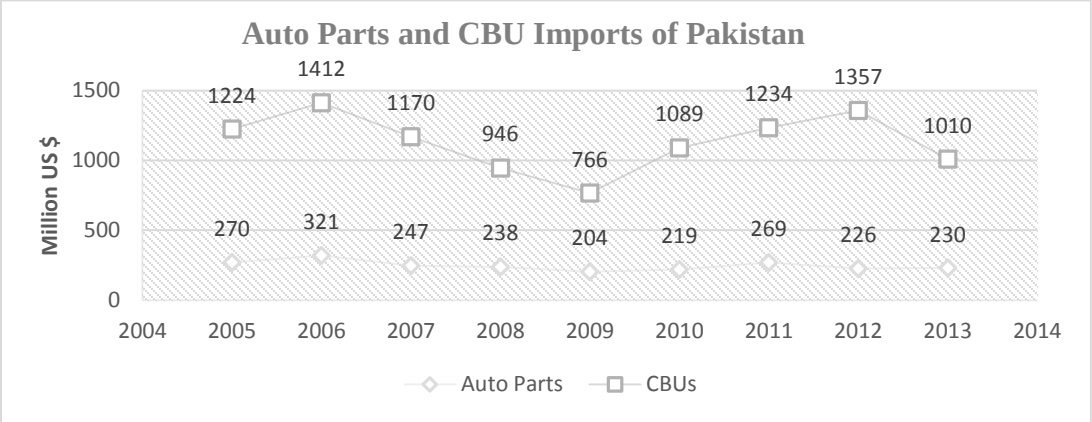


Figure 4.1b: Auto Parts and CBU Imports of Pakistan

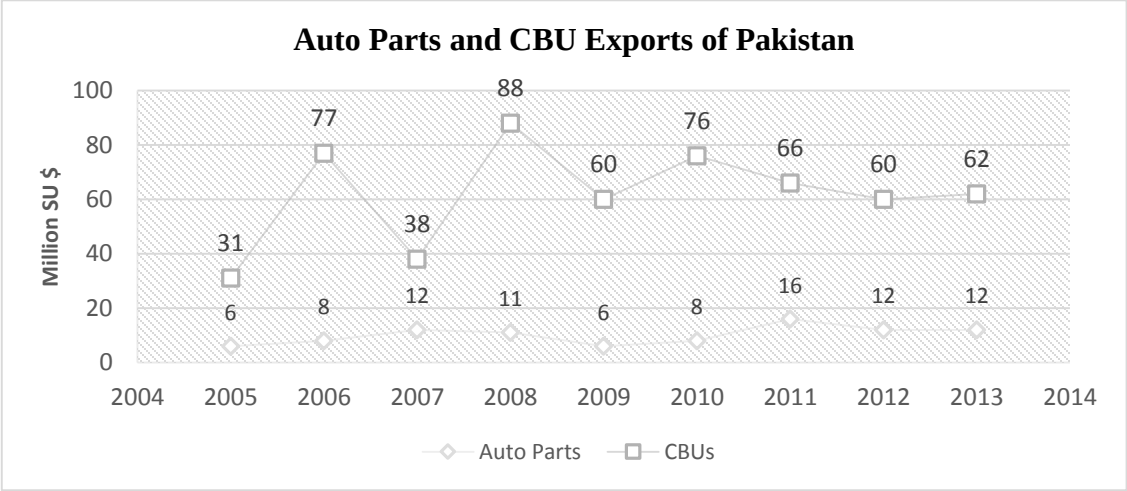


Figure 4.1c: Auto Parts and CBU exports of Pakistan

4.8 Automotive Parts Manufacturing Industry

Automotive parts suppliers operating in Pakistan are estimated at around 1,600 to 1,700 companies. The majority of them are engaged in the production of spare parts related to repair of vehicle. Out of 1700 companies, 240 companies are manufacturing parts for OEM. They mainly supply single unit parts and few make components combining multiple parts. In this scenario, the auto parts industry in Pakistan does not have clear multiple tiers and most of them are considered to be the first tier suppliers as they directly supply products to OEM / automakers.

Improvement of the industry competitiveness constitutes a major issue for the Pakistani automobile industry. Commonly faced problems by quality professionals when they move in Pakistani industry and try to spread the movement of quality are loss of management control over subordinate's fear of the unknown, resistance to change, lack of training, resources no time for Kaizen activities, job security and uninterested manpower. Figure 4.1c related to the export of auto parts shows a somewhat stable trend. Exports gradually increased after 2009 and began to decline in 2011. The declining trend in automobile exports might be explained by the energy shortage in the country due to lack of international quality standards.

4.9 **Analysis of Kaizen Practices in Pakistani Automobile Industry**

Asia-Pacific region is considered to be a big importer of new quality management and continuous improvement techniques. The economic reforms have been taking place in many of the countries of this region due to which these countries are facilitating their local firms to compete the global market with high standard of quality products. Joint ventures, strategic alliances and collaborations among different countries have come up as a result. Consequently, a large number of organizations of these countries have started their operations in a number of other countries and have risen as multinational companies. In Pakistan the automobile market was fully operational in late 1980s. The competitiveness of these organizations was assessed through continuous improvement activity and innovations. With the passage of time, Pakistani industry has also started to follow this trend for its survival.

The leading automobiles manufacturing companies have identified their core competency in the market and have evolved an appropriate continuous improvement strategy for their organizations. This research study will cover major Pakistani automobile manufacturing companies implementing Japanese management techniques such as Kaizen for CI of their process and quality of their product. It will also analyze the advancements made in Kaizen technique by automobile parts manufacturers in Pakistan with special consideration of clarity in implementation of CI technique rather than mere manufacturing and operational know how. By developing the capabilities to adapt and implement new techniques, they can enhance their performance.

4.10 Survey Results Related to Kaizen Awareness and Implementation Status in Automobile Sector of Pakistan-

In order to check the Kaizen implementation status in automobile sector of Pakistan and to confirm different factors affecting Kaizen, a survey questionnaire comprising of two parts was designed and attached as Annexure B & C. During Phase-1 of the survey, Part-I of the survey questionnaire was circulated to 455 different automobile sector organizations including part manufacturers and automobile service providing organizations. Out of these 455 organizations only 216 organizations responded to the survey questionnaire by giving their response on all questions, showing a response rate of 48.8%. Forty two organizations responded partially and their response was not included in the final analysis of the data. Most of the respondent organizations were members of Pakistan Association of Automotive Parts & Accessories Manufacturers (PAAPAM) and Pakistan Automobile Manufacturing Associations (PAMA).

The survey was conducted to check the demography, human resource development, and implementation status and awareness level of organizations regarding different Kaizen / Quality management tools for continuous improvement of their organizations. The opinion of respondents from these organizations regarding confirmation of selected key variables affecting Kaizen implementation and its outcome as identified through literature review was also sorted out before conducting Phase-II of survey. An overall awareness and Implementation status of Kaizen / quality management tools and techniques was found good and satisfactory in 97 different automobile sector organizations including organizations from service sector as well. In Phase-II of the survey, Part-II of survey questionnaire was disseminated to only those selected organizations of Phase-I which were implementing Kaizen / Quality management tools for continuous improvement of their organization. The results and the analysis of qualitative data collected through Phase-I are given as follows:-

4.10.1 Survey Result Regarding Location of Respondents Organizations

The location of organizations participated in survey are shown in Figure 4.2. The results indicate that 53.7% organizations were from Punjab province, 37% from Sindh, and 5.6% from Islamabad, 2.3% from Baluchistan and only 1.4% were from KPK province of Pakistan. Overall surveyed organizations were distributed throughout Pakistan.

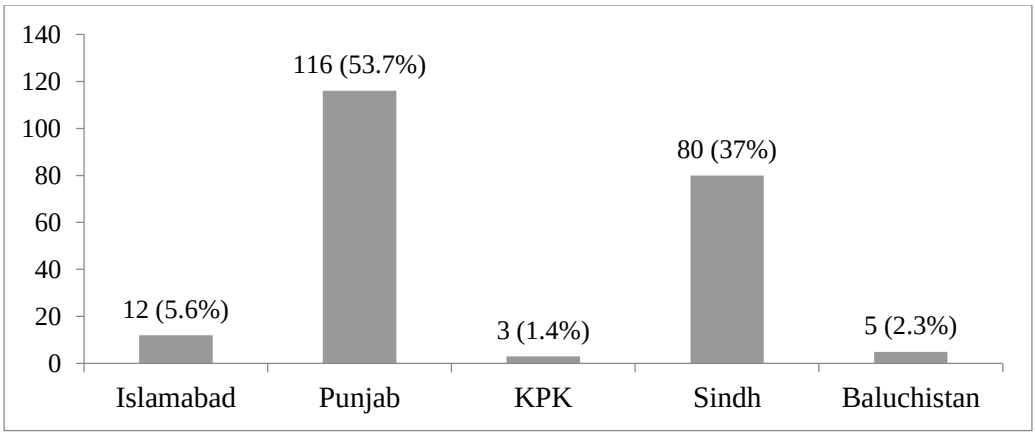


Figure 4.2: Location of Surveyed Organizations

4.10.2 **Size of the Respondents Organizations**

Results shown in Figure 4.3 indicates the size of the surveyed organizations based on the number of employees. 26.4% respondent organizations mostly from vendor industries and service providing organizations have less than 50 employees, whereas 47% organizations have employees ranging from 50 to 100, 19% organizations have employees range from 101-200 and approximately 7.4% organizations have employees over 200.

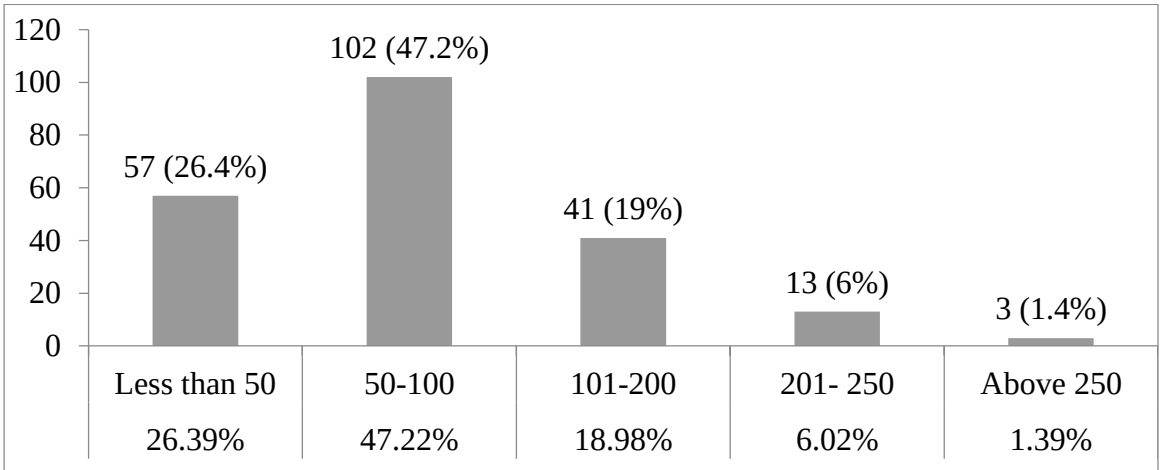


Figure 4.3: Size of the Surveyed Organization

4.10.3 **Designation of the Respondents in the Surveyed Organizations**

Results shown in Figure 4.4 reflects designation of respondents and their percentage in overall participants of survey group from automobile industries and shows that major share is of

general managers / production managers (39.7%), then come supervisors (24%), quality managers (20.2%) and finally Kaizen team leaders/team members (16.1%).

Figure 4.4: Designation of Respondents in the Organization

4.10.4 **Experience of Respondents**

Results shown in Figure 4.5 presents the results of the survey regarding experience of individuals responding to survey questionnaire from automobile sector organizations. 29% respondents have up to 5 year experience, 51% have experience between 5-10 years, and 17% have experience from 11-15 years, whereas only 2.8% respondents have experience of 16 to 20 years in present organizations selected for survey.

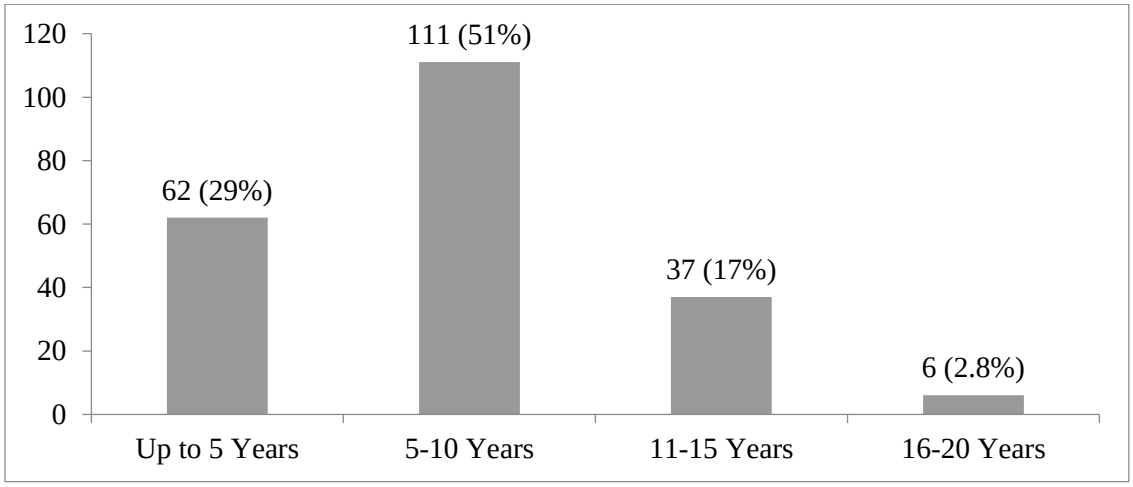


Figure 4.5: Experience of Individual Respondents

4.10.5 **Type of Products / Services Provided by the Respondents Organizations**

Results shown in Figure 4.6 indicates the type of product or services being provided by the surveyed organizations. 4% organizations manufacture cars and pickups, 49.5% manufacture parts for automobile and 18% are manufacturing motor cycles, whereas 2.3% are manufacturing tractors, 3% organizations are manufacturing rickshaws and 24% organizations are providing services as well as parts and other accessories to automobile customers.

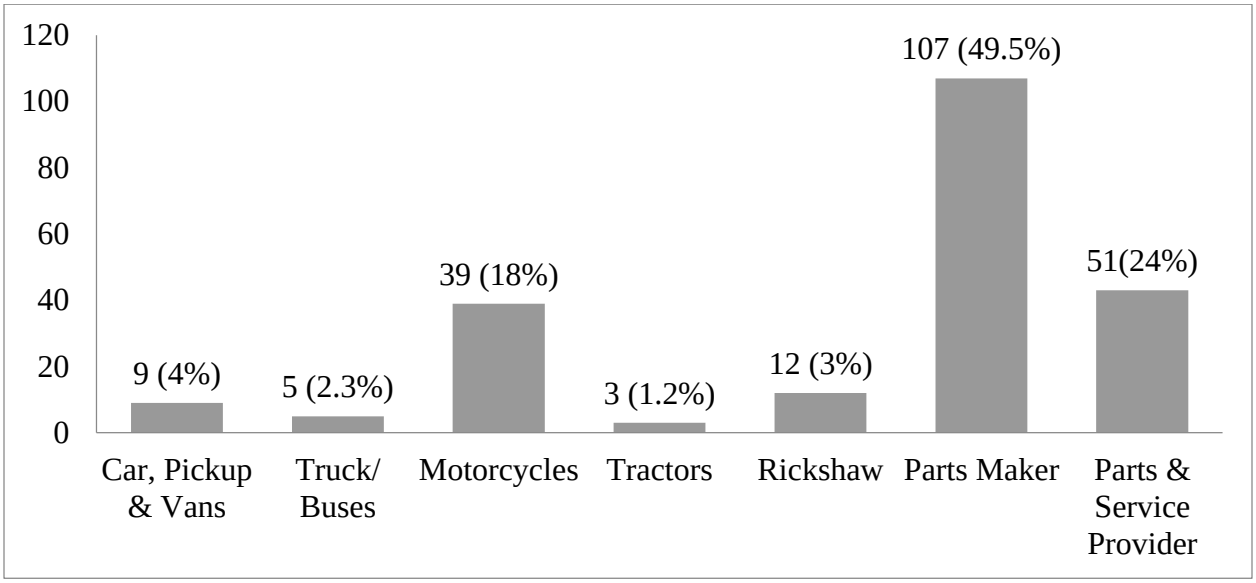


Figure 4.6: Type of Products of Respondent Organizations

4.10.6 **Presence of Established Kaizen Culture**

The survey result of the questions, had existence of established Kaizen culture shows that 17.6% organizations, mostly Japanese based multinational companies and their subsidiaries have established the culture of continuous improvement. 52.8% of the organizations have no established Kaizen culture. 29.6% organizations have partially established system of continuous improvement. Survey results are shown in Figure 4.7 as follows.

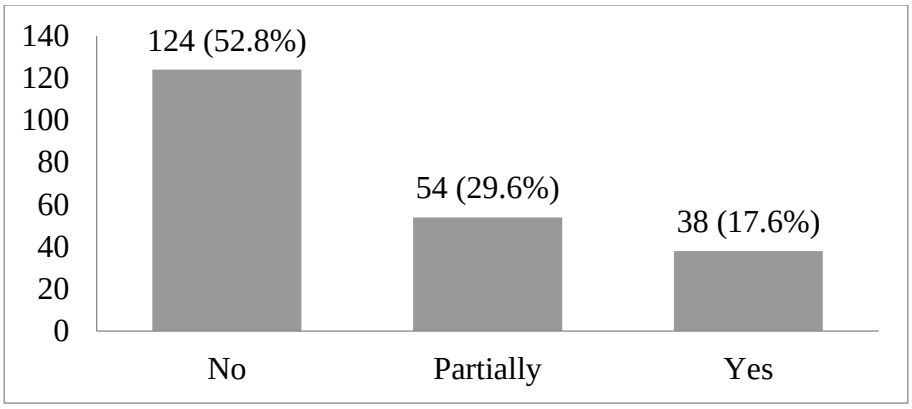


Figure 4.7: Presence of Established Kaizen Culture

4.10.7 **Management Competency, Skill level and Commitment to Kaizen**

Employees of the companies surveyed were divided into three groups:

a. Top Management - Managers and Directors.
b. Middle Management - Assistant Managers and Supervisors
c. Lower Management - Shop floor Workers and Operators.

The attributes, such as technical competency, quality management skills, commitment towards practicing and promoting Kaizen activities in the organizations were analyzed among top management of the organizations. Whereas attributes such as trade skill level, educational level, involvement and initiatives taken towards quality management / Kaizen were analyzed among middle and lower level management of the organizations.

4.10.8 **Top Management**

Technical competency of top management showed 70% good technical competence in their own fields, 22% have satisfactory competence level, whereas 8% of the organizations were found weak in technical competency. 64% top management was weak in quality management skill, whereas 26% were having satisfactory skill level of QM and 10% were good. 15% top management of the organizations had good commitment and was dedicated to the promotion of quality management / Kaizen practices, whereas 50% were having weak and 35% of the organizations have satisfactory commitment to quality management / Kaizen practices in their organizations.

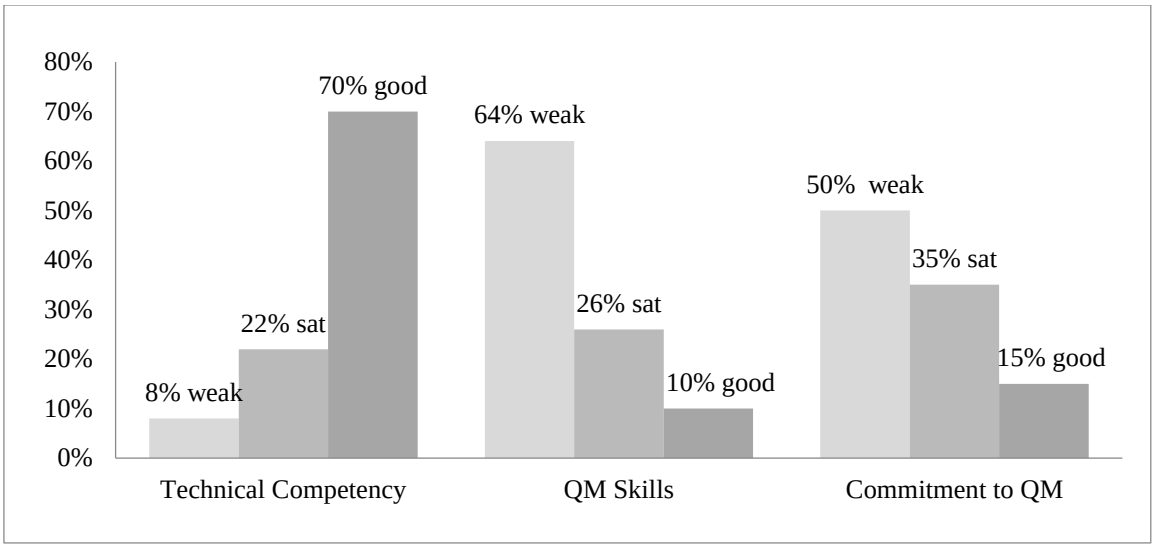


Figure 4.8: Top Management Strength / Weaknesses

	Technical Competency Level			**Quality Management Skill**			**Commitment to QM / Kaizen Activities**		
	Good	Satisfactory	Weak	Good	Satisfactory	Weak	Good	Satisfactory	Weak
Top Management	70%	22%	8%	10%	26%	64%	15%	35%	50%

4.10.9 **Middle Management (Supervisory Staff)**

70% of Middle Management (supervisory staff) have good technical capabilities and competence in their areas of work, whereas 22% were satisfactory, and 8% were technically weak. 77% of middle management was weak in quality management skills and practices, while 13% were having satisfactory and remaining 10% were good in QMS.48% middle management (supervisors) have weak commitment, while 35% were satisfactory and 17% were having good commitment level to QM.

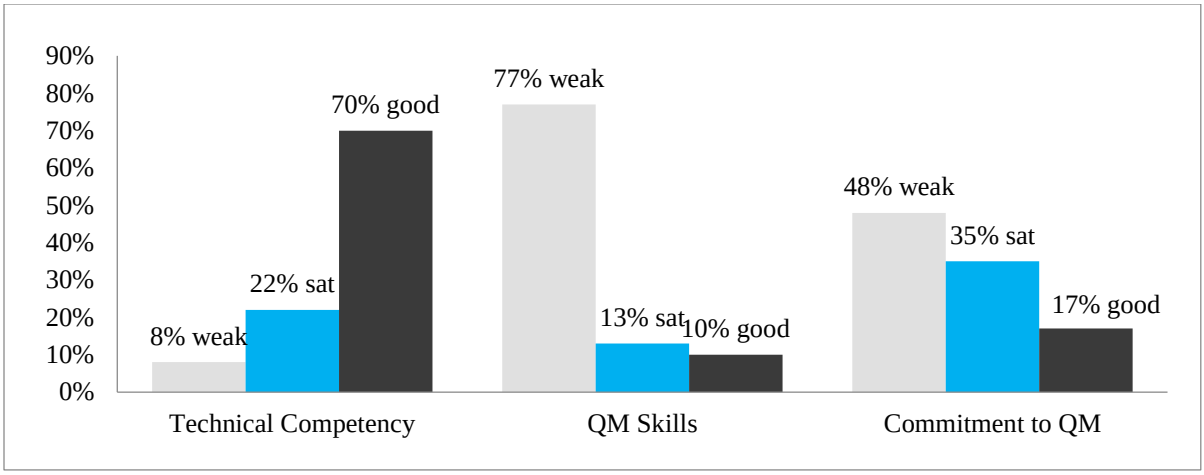


Figure 4.9: Strength and Weakness of Middle Management

	Technical Competency Level			Quality Management Skill			Commitment to QM / Kaizen Activities		
	Good	Satisfactory	Weak	Good	Satisfactory	Weak	Good	Satisfactory	Weak
Middle Management	70%	22%	8%	10%	13%	77%	17%	35%	48%

4.10.10 Lower Management (Shop Floor Workers)

70% of lower management was good in their trade skills, whereas 25% were satisfactory and 5% weak skilled workers were found in respondent organizations. 60% lower management including supervisor level staff and shop floor workers were weak in quality management skills and practices, while 28% had satisfactory level and remaining 12% were good in QMS. 65% organizations' lower level management participation / involvement in Kaizen initiatives was found weak, while 25% was satisfactory and 10% was good.

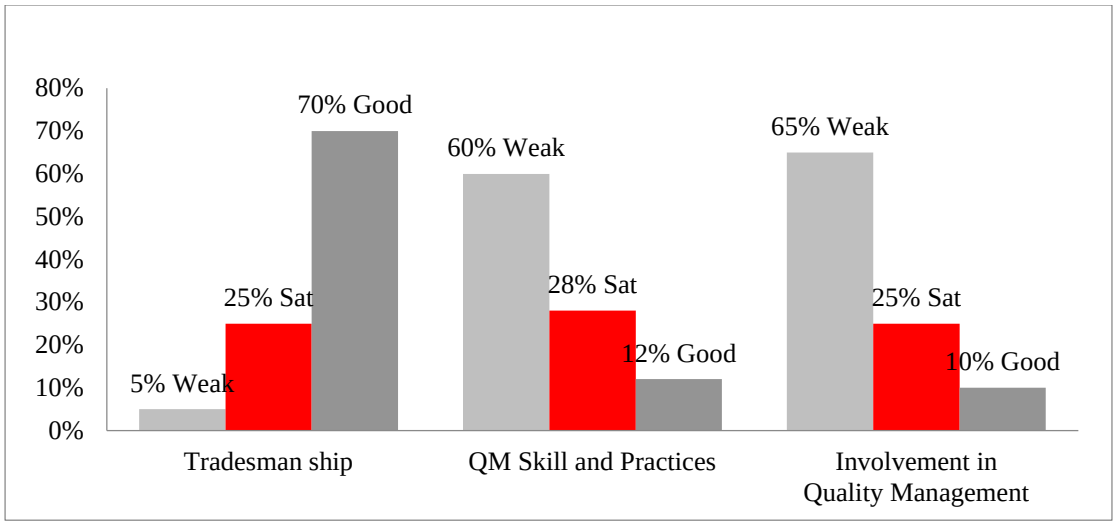


Figure 4.10: Lower Management Competency Level (Shop Floor Workers)

	Technical Competency Level			Quality Management Skill			Commitment to QM / Kaizen Activities		
	Good	Satisfactory	Weak	Good	Satisfactory	Weak	Good	Satisfactory	Weak
Lower Management	70%	25%	5%	12%	28%	60%	10%	25%	65%

4.11 Analysis of Management Competency, Skills Level and Commitment to Kaizen

Top management's biggest shortcoming is lack of quality management skills (64%), followed by a lack of sufficient commitment (50%). Technical competency is usually good (70%). Middle management's biggest shortcoming is also lack of awareness of quality management skills (77%), followed by insufficient commitment to practicing and promoting quality (48%). Technical competence is usually good (70%). Supervisors / workers' biggest shortcoming is lack of involvement / taking initiative in Kaizen activities (65%), followed by their insufficient quality management skill / practices and its promotion (60%), while technical skill was graded as good (70%) and satisfactory (25%).

4.12 Existence of Human Resource Development System and its Analyses

This covers the systems and procedures for the development of employees of the organization. It includes selection procedures, orientations and training procedures, career development, and creating motivation in the organization. Two aspects were checked:

a. HRD as an organized function / department in the company.

b. The quality of the HRD activities (both formally and informally) being carried out in the organization.

The results were as follows:-

a. HRD was not an organized function in 80% of the companies, while it was reasonably organized in 20% of the organizations in the form of a separate dedicated department. The quality of human resources development function was weak in 75% of the cases, while satisfactory in 15% and good in 10% organizations surveyed.

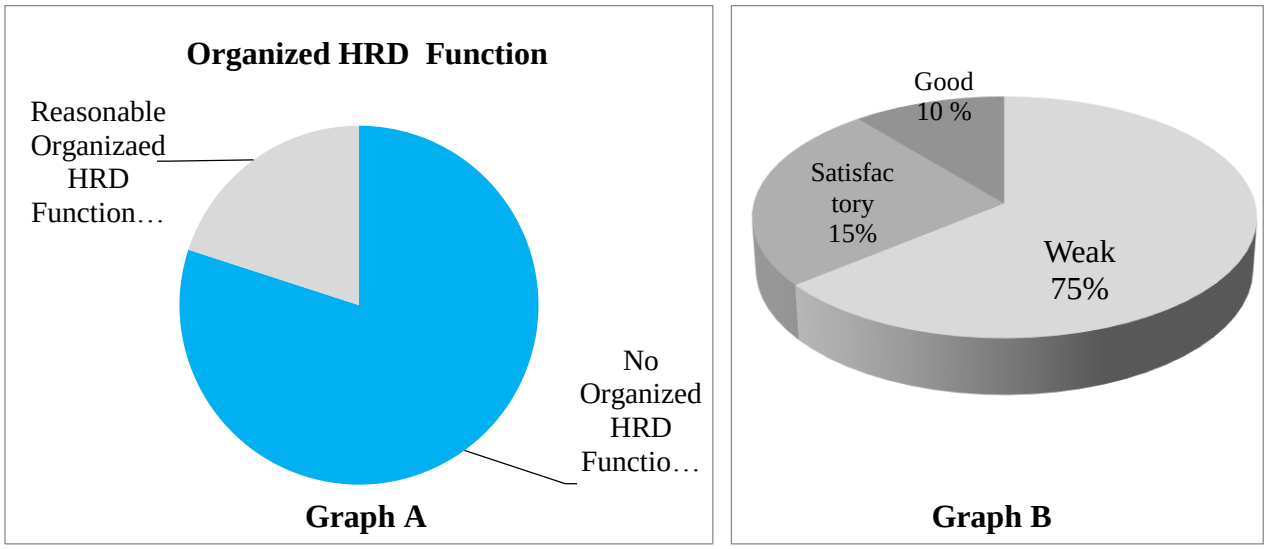


Figure 4.11: Establishment of HRD as an Organized Function

HRD was found to be a weak area. The management generally knows about weakness of human resource development. The human resource development managers were found to be ineffective due to lack of competency, commitment with the cause, and resources. According to the world-wide automobile sector research by Rommel (1995), companies aim for training their employees on a small number of tools which are relevant to their job, and hold the appropriate training during the tools introductory phase. Fundamental to the selection of training of an individual is that each individual learns only those skills that he / she needs to use all the time in his / her day to day work. In this regard 'learning by doing' is the best approach.

4.13 **Implementation Status and Awareness Level of Quality Management Tools**

The following seven quality management and CI tools were checked for awareness level and implementation status in the companies surveyed:

a. ISO 9000 QMS
b. Quality Control Circle
c. Kaizen
d. 5 S
e. Benchmarking
f. 7 basic QC Tools
g. Customer Surveys

Generally the implementation of these tools in different organization was checked from awareness and implementation status point of view. It was then rated as Good, Satisfactory and Poor / weak.

a. Overall awareness level about the CI tools in the organizations
b. Implementation status of CI tools in the organizations

4.13.1 **ISO 9000 Quality Management System and Standards**

A quality management system focuses on quality assurance principles. It provides a framework that ensures prevention of mistakes in every operation. ISO 9000 standards are used by independent certification agencies for third party certification. This tool was checked from the point of view of awareness and implementing its basic process in the organization and its consistency. The results of survey are shown in Figure 4.12.

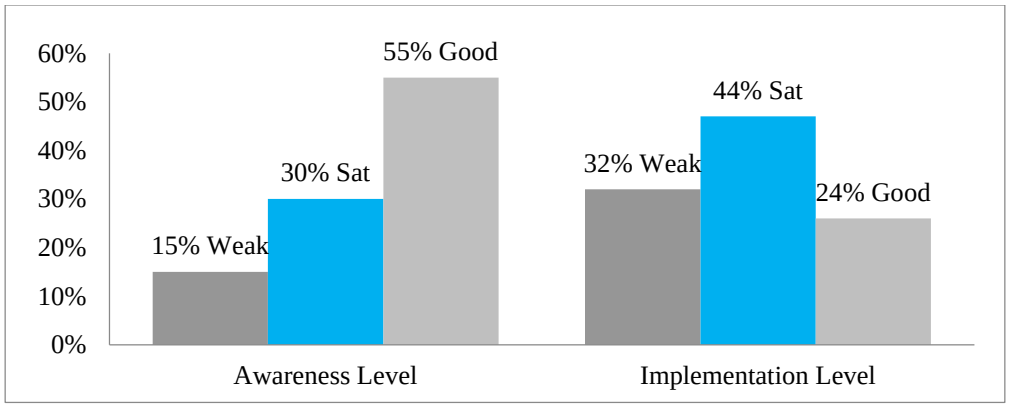


Figure 4.12: Awareness and Implementation level of ISO 9000 Quality Management System

Result of the survey shows that awareness level of this tool is good in 55% of the organizations, satisfactory in 30% of the organizations and weak in 15% of the total organizations surveyed. Whereas, implementation status of this tool is good in 24% of the total surveyed organizations, satisfactory in 44% and weak in 32% of the total organizations surveyed.

4.13.2 **Quality Control Circle**

These are small groups of workers / supervisor's activities, consisting of 3 to 10 workers and perform similar job voluntarily. They meet together for an hour per week regularly during their routine work under the leadership of their team leader or manager. This group of people has sufficient training on identification, analysis and solution of the problem of their own field. The quality circles were checked from the point of view of understanding and implementing their basic process, organization, and consistency. The results of survey are shown in Figure 4.13.

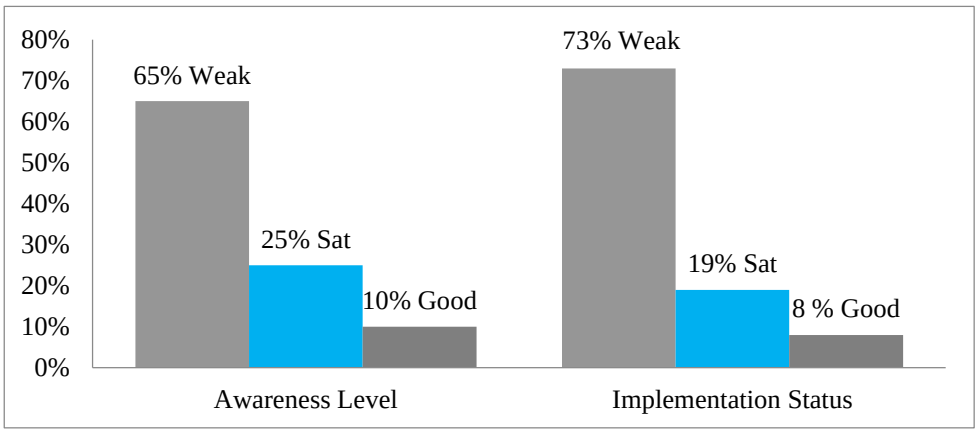


Figure 4.13: Awareness Level and Implementation Status of Quality Circle

Result of the survey shows that awareness level of this tool is good in 10% of the organizations, satisfactory in 25% of the organizations and weak in 65% of the total organizations surveyed. Whereas, implementation status of this tool is good in 8% of the total surveyed organizations, satisfactory in 19% and weak in 73% of the total organizations surveyed.

4.13.3 **Kaizen**

Kaizen means continuous improvement based on participation and commitment of shop floor workers using their own knowledge and experience supported by top management. Kaizen can be established through suggestion schemes. It involves workforce at all levels for continuous improvement in their own work areas (Kanji, Malek, & Tambi, 1999). The tool was checked from the point of view of understanding and implementing its basic process and consistency. The results of survey are shown in Figure 4.14.

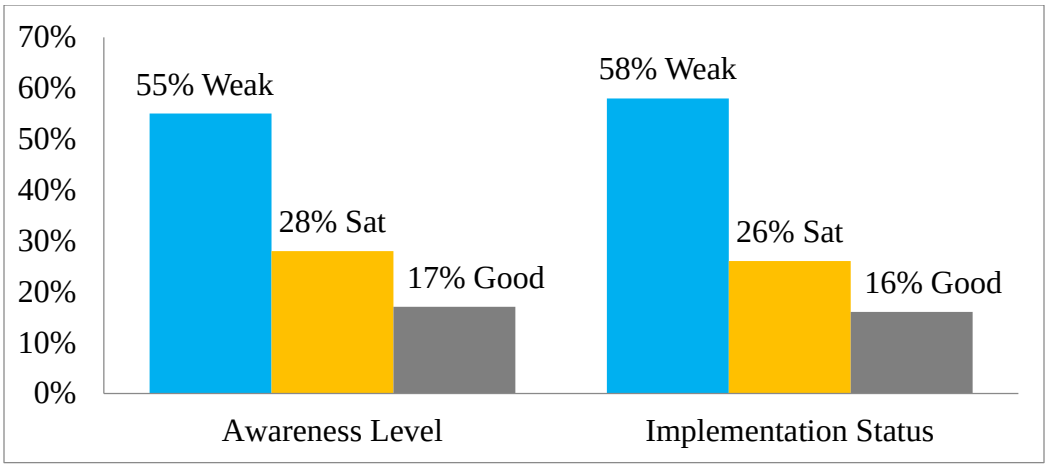


Figure 4.14: Awareness Level and Implementation status of Kaizen / Suggestion system

Result of the survey shows that awareness level of this tool is good in 17% of the organizations, satisfactory in 28% of the organizations and weak in 55% of the total organizations surveyed. Whereas, implementation status of this tool is good in 16% of the total surveyed organizations, satisfactory in 26% and weak in 58% of the total organizations surveyed.

4.13.4 **5S**

5S is a companywide self-initiative cleanliness program. It is a combination of five Japanese words started with word “S” translated in English as Cleanliness, Arrangement, Neatness, Discipline and Order. The tool was checked from the point of view of understanding, implementing its basic process and consistency. The results of survey are shown in Figure 4.15.

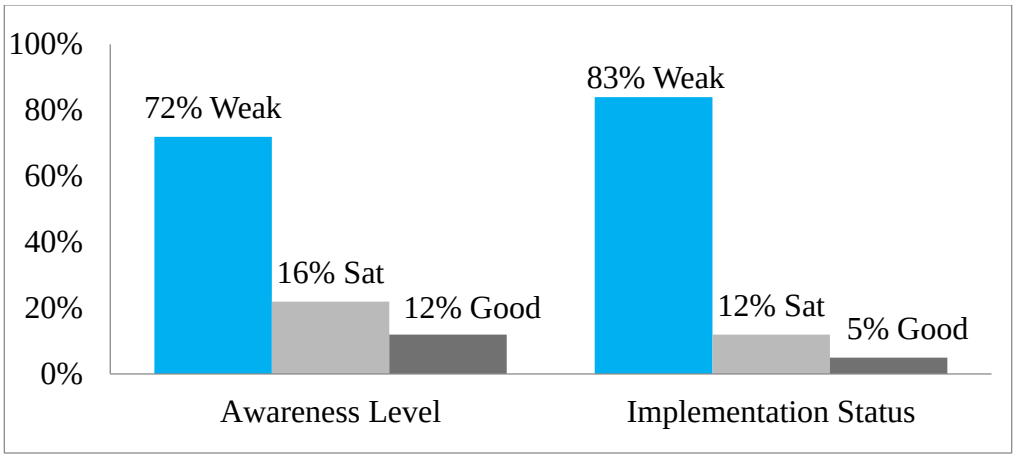


Figure 4.15: Awareness Level and Implementation Status of 5S

Result of the survey shows that awareness level of this tool is good in 12% of the organizations, satisfactory in 16% of the organizations and weak in 72% of the total organizations surveyed. Whereas, implementation status of this tool is good in 5% of the total surveyed organizations, satisfactory in 12% and weak in 83% of the total organizations surveyed.

4.13.5 **Benchmarking**

Through this tool comparison of own practices with best available practices in the market is made. Through benchmarking the best practices are recognized and it has been tried to fill the gap between own practices and the best available practices to improve performance of the organization. Benchmarking is done through three different ways (Kanji and Asher, 1996) shown as follows:

a. "Internal" mean within departments
b. Competitive
c. Comparative

This tool was checked from the point of view of understanding and implementing its basic process, organization, and consistency in the survey. The results of the survey are shown in Figure 4.16.

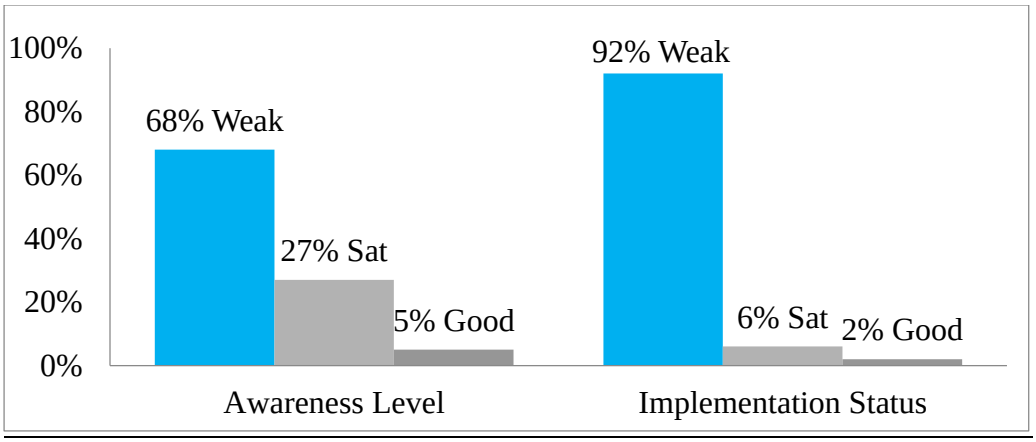


Figure 4.16: Awareness Level and Implementation Status of Benchmarking

Result of the survey shows that awareness level of this tool is good in 5% of the organizations, satisfactory in 27% of the organizations and weak in 68% of the total organizations surveyed. Whereas, implementation status of this tool is good in 2% of the total surveyed organizations, satisfactory in 6% and weak in 92% of the total organizations surveyed.

4.13.6 **Seven Basic Quality Control Tools**

The basic and fundamental statistical / analytical tools and techniques used for data collection, data presentation and data analyses for quality control and improvement of process are known as 7 Basic QC Tools. These 7 Basic QC tools consist of graphs, histograms, check sheets, scatter diagrams, Pareto diagrams, cause and effect diagrams and control charts. The results of survey are shown in Figure 4.17.

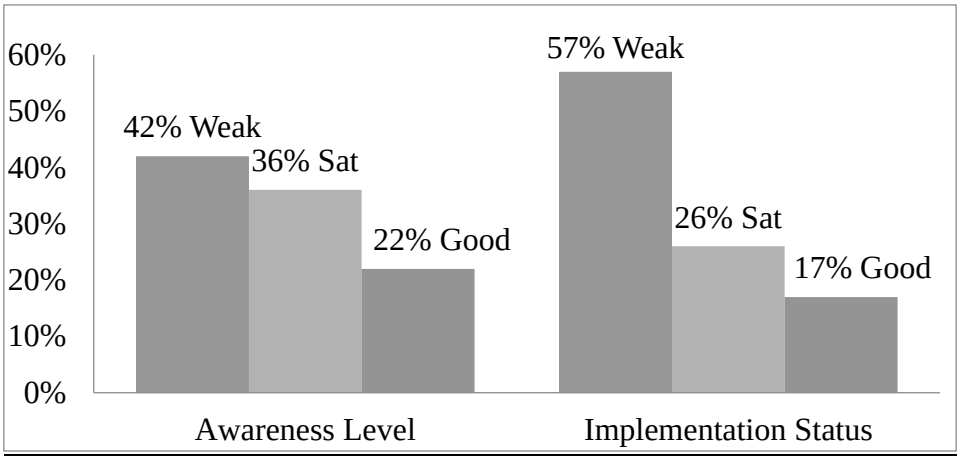


Figure 4.17: Awareness Level and Implementation Status of Seven Basic QC Tools

Result of the survey shows that awareness level of this tool is good in 22% of the organizations, satisfactory in 36% of the organizations and weak in 42% of the total organizations surveyed. Whereas, implementation status of this tool is good in 17% of the total surveyed organizations, satisfactory in 26% and weak in 57% of the total organizations surveyed.

4.13.7 **Customer Survey**

This tool is used to identify the changing trends in customers stated and implied needs. This tool was checked from the point of view of awareness and implementation standard. The results of survey are shown in Figure 4.18.

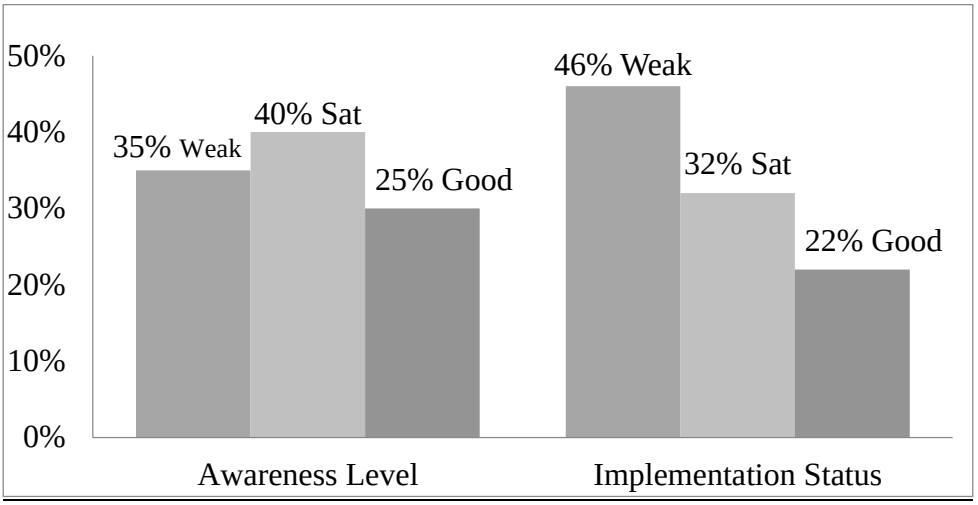


Figure 4.18: Awareness Level and Implementation Status of Customer Survey

Result of the survey shows that, awareness level of this tool is good in 25% of the organizations, satisfactory in 40% of the organizations and weak in 35% of the total organizations surveyed. Whereas, implementation status of this tool is good in 22% of the total surveyed organizations, satisfactory in 32% and weak in 46% of the total organizations surveyed**.**

4.14 **Analysis of Awareness & Implementation Level of Quality Management Tools**

4.14.1 **Tools Rated Good in Awareness**

The result shows that maximum awareness level about the quality management tool rated as good only is that of ISO 9000 quality management system and standard (55%), customer survey (30%), 7 basic QC tools (22%). Overall awareness level of quality management / Kaizen tools and techniques in automobile sector organizations of Pakistan rated as good are shown in Figure 4.19.

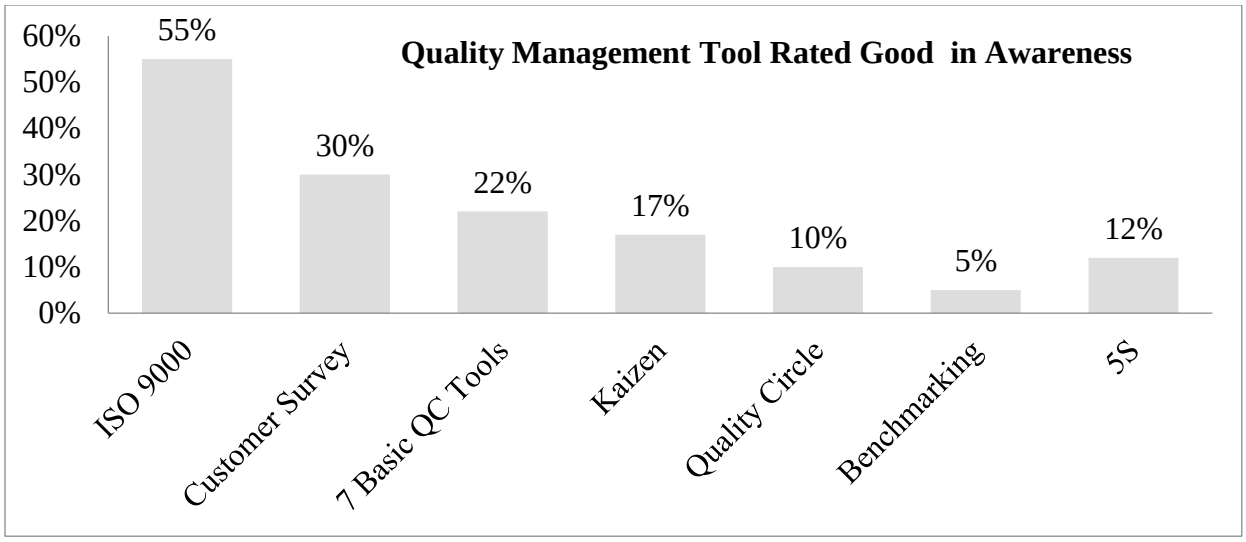


Figure 4.19: Quality Management Tools Rated as Good in Awareness

4.14.2 **Implementation Status of Tools Rated as Good**

The result shows that maximum value of implementation status about the quality management tool rated as good only is that of ISO 9000 quality management system and standard (26%), customer survey (22%), 7 basic QC tools (17%). The resultant rating good is shown in Figure 4.20.

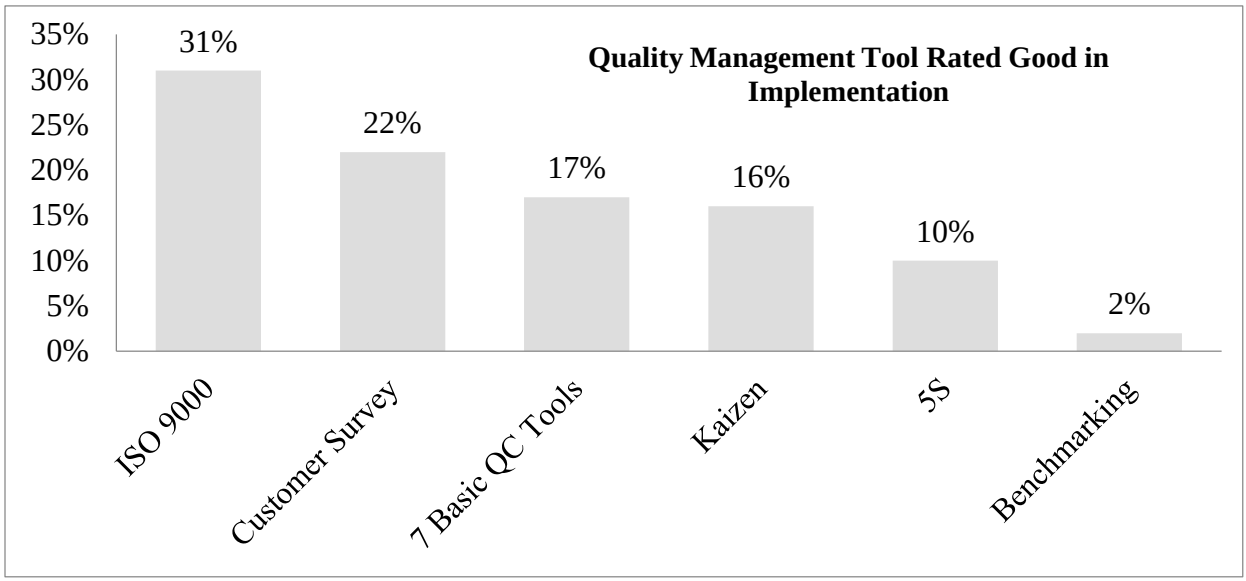


Figure 4.20: Implementation Status of Quality Management Tools rated as Good

4.15 Quality Control (QC) and Quality Assurance (QA) Practices

Quality control means inspection of finish product to identify defective items and reporting to management regarding maintaining data and making decisions to pass or declare failure of items / products; whereas, quality assurance improves and stabilizes production, and associated processes to avoid or minimize issues that lead to defects in the product. It was observed from the results of the survey that with few exceptions, the automobile industries largely do not have an established department of quality control. Only 30 respondents have confirmed that they have an established department of quality control. Whereas 17% of the organizations have employed a fulltime inspector and 20% of the organizations do inspection through workers and operators on the production line. 8% of the organizations have finished and semi-finished goods inspection system. Most of the organizations have certain individuals with multiple responsibilities including QC.

4.16 Overall Analyses of Kaizen Practices in Automobile Sector of Pakistan

Kaizen implementation requires effective know-how about Kaizen tools and techniques, commitment from top management and resources mad available from organization. These factors were checked in all the companies surveyed. The results are as follows:

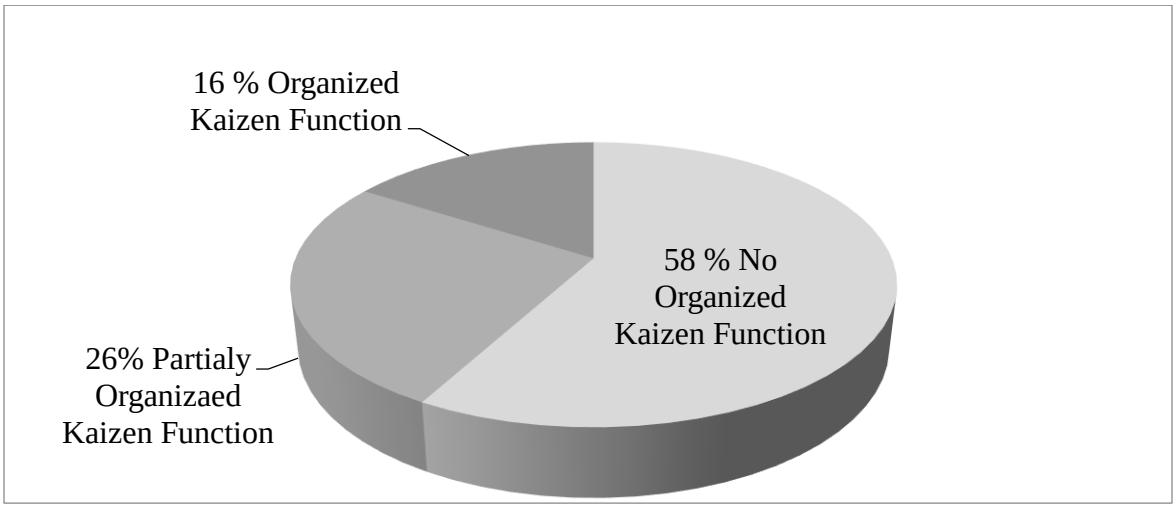


Figure 4.21: Kaizen Implementation Status

a. In 58% of the companies, there was no organized Kaizen program and there was no intention to start one in near future. Whereas, 26% of the companies were having a strong desire, but having partially organized Kaizen program.

b. In 16% of the automobile sector organizations, there was an organized and effective Kaizen program running.

c. The overall trend indicates that the best Kaizen practices were in Karachi, followed by Lahore and Islamabad.

d. Karachi, Lahore and Islamabad are the cities where organized Kaizen Programs were relative more in number as compared to other areas.

e. The relatively strong areas found in Lahore were: customer surveys and 7 basic QC tools while weak areas were: SPC, HRD, quality circle awareness. The companies in this city were the weakest in Kaizen practices

f. The relatively strong areas found in Karachi were organized Kaizen programs, middle management commitment and customer surveys. Weak areas were, HRD, TMC, and quality circle awareness.

4.17 Confirmation of Key Factors Affecting Kaizen from Automobile Sector of Pakistan

The result of survey questions regarding effect of key factors on implementation of Kaizen in automobile sector's organizations shows that majority of respondents (65% to 85%) are of the opinion that factors shown in Table 4.7 affect the outcome of Kaizen implementation in automobile sector's organizations. The result of the survey regarding confirmation of key factors affecting Kaizen in automobile sector's organizations of Pakistan is shown in Table 4.7.

Table 4.7: Survey Result of Key Factors Affecting Kaizen Implementation

S/No	Key Factors	Yes (%age)	No (%age)	No Opinion (%age)
1	Top Management Commitment (TMC)	77.70	17.50	4.63
2	Organizational Kaizen Culture (OKC)	65.70	30.50	3.7
3	Personal Initiative of Employees (PIE)	82.40	15.70	1.85
4	Rewards and Recognition given to Workers (RR)	80.50	16.60	2.78
5	Training & Education of Workers (TOW)	70.80	27.30	1.85
6	Kaizen Event and Team Design (KETD)	65.74	32.87	1.39
7	Action Oriented Kaizen (AOK)	86.57	11.50	1.85
8	Employees Commitment to Kaizen (ECK)	85.65	12.90	1.39
9	Expertise on Kaizen Tools & Techniques (EKTT)	79.63	18.50	1.85
10	Standardization of Organization Internal Process (SOIP)	76.39	21.70	1.85

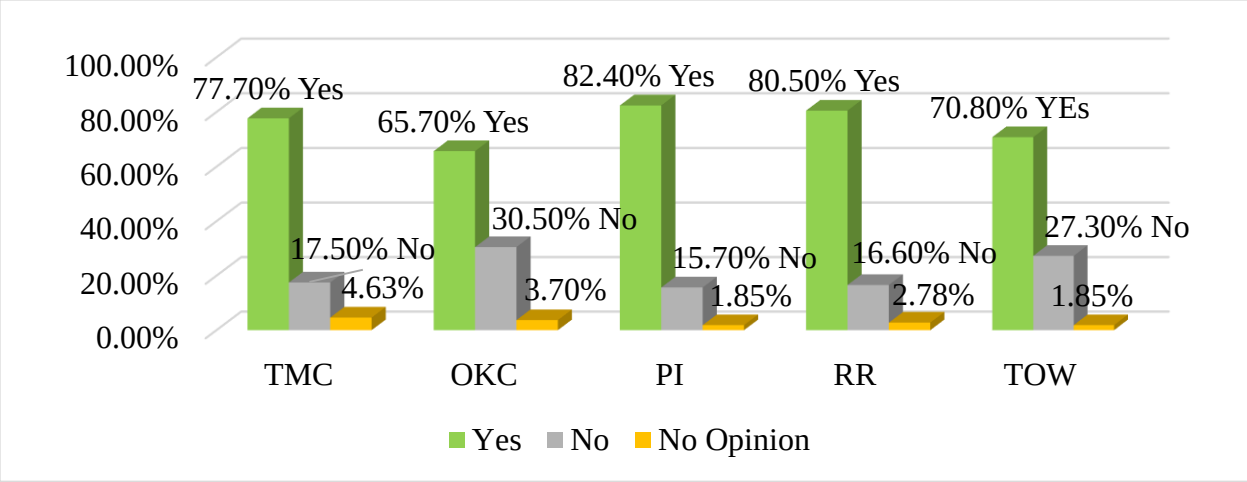


Figure 4.22a: Confirmation of Key Factors Affecting Kaizen Implementation

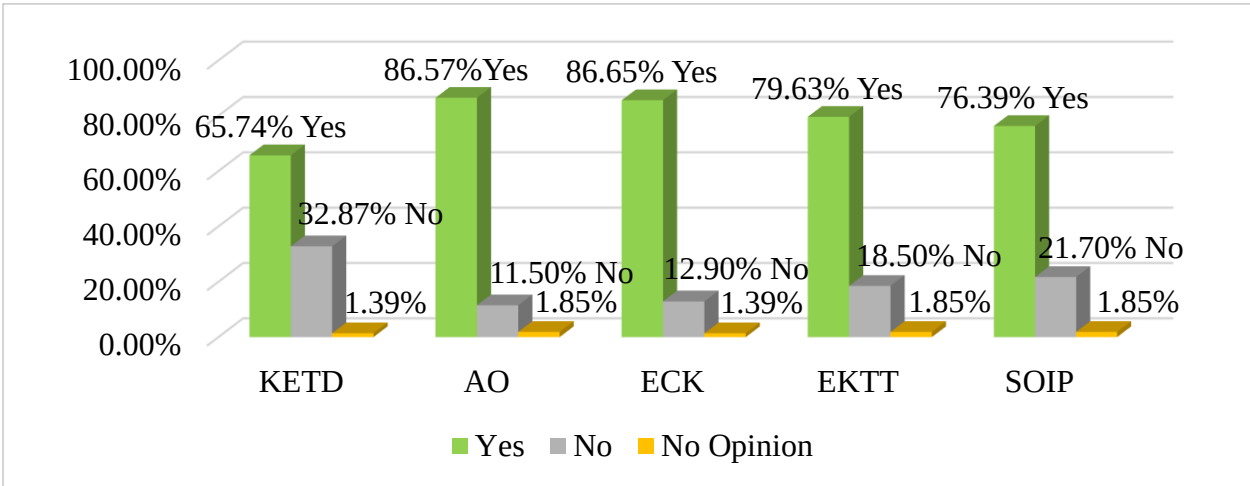


Figure 4.22b: Confirmation of Key Factors Affecting Kaizen Implementation

4.18 Confirmation of Outcomes of Kaizen from Automobile Sector Respondents

The result of survey questions regarding outcomes of implementation of Kaizen in automobile sector's organizations shows that most of the respondents (66% to 79%) are of the opinion that factors shown in Table 4.8 are results of effective Kaizen implementation. The detailed result of the survey regarding outcome of effective Kaizen implementation in automobile sector's organizations of Pakistan is shown in Table 4.8.

Table 4.8: Survey Result - Outcomes of Effective Kaizen Implementation

S/No	Outcome Factors of Kaizen	Yes % age	No %age	No Opinion %age
1	Human Resource Development (HRD)	79.63	16.20	4.17
2	Work Area Improvement (WAI)	68.98	27.78	3.24
3	Organization Internal Process Improvement (OIPI)	79.17	18.06	2.78
4	Product Quality Improvement (PQI)	75.93	20.37	3.70
5	Overall Success of Kaizen (OSK)	66.67	31.94	1.39

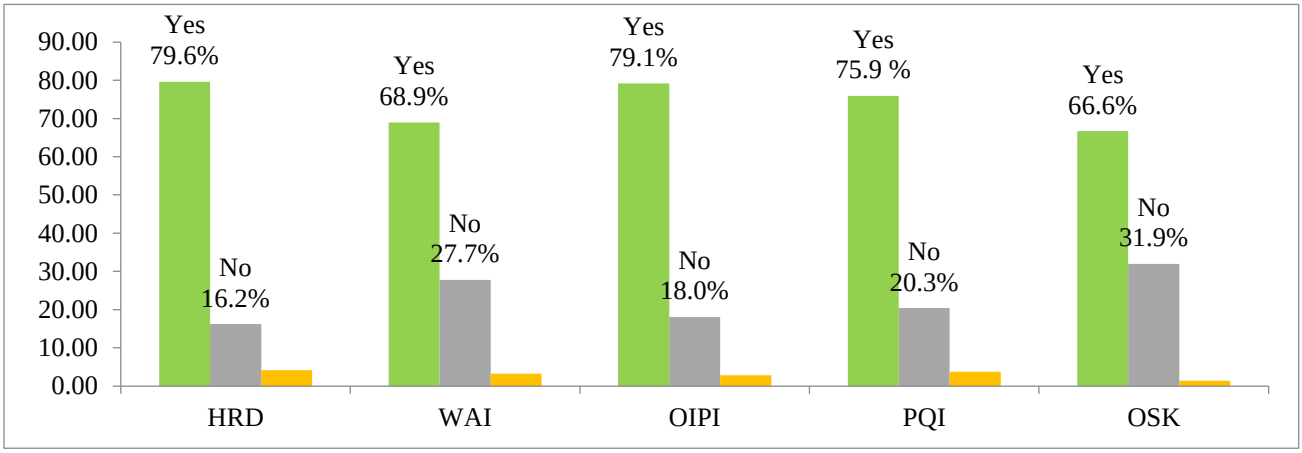


Figure 4.23: Confirmation of Outcome Factors of Kaizen

4.19 Summary

This chapter consists of the overview of Kaizen practices in automobile sector of Pakistan. Initially introduction of automobile industry of Pakistan and its history is given. After that categories of Pakistan automobile industry have been explained. Current state, major characteristics and share of automobile in overall trade of Pakistan has been discussed. Details regarding automotive parts suppliers operating in Pakistan has been given. In next section Kaizen practices in automobile industry of Pakistan were analyzed. The discussion on survey results regarding Kaizen implementation status in automobile industry of Pakistan have been made. Management competency, skill level and commitment to Kaizen have been delineated in next sections. Analysis of survey results has been carried out. Confirmations of different key variables affecting Kaizen along with different outcomes of effective Kaizen implementation in an organization was carried out through survey in last section of this chapter.

CHAPTER 5: RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter explains the findings of the research study. Section 5.2 describes the background of the respondents and their organizations. It includes demographic factors such as location, size in the form of number of employees of the respondent's organization, designation and experience of respondents, continuous improvement tools being used and competency level of respondents on Kaizen tools and techniques. Section 5.3 highlights aggregation of individual level mean response of survey into an organization level mean response, whereas section 5.4 describes the descriptive statistics of organization level mean response.

Section 5.5 consists of hypotheses testing. Hypotheses H1 to H2 were tested through finding of Pearson Correlation Coefficient Values. Section 5.6 to 5.11 cover developing of regression models for each dependent variable of Kaizen through multiple linear regression analysis for the confirmation of hypothesis H-3 to H-5 counting toward development of framework for effective implementation of Kaizen in automobile sector organizations. Finally, Multiple Regression Models of different outcome variables of Kaizen are summarized in section 5.12. Mediation effect of PV was checked through Hierarchical Multiple Linear Regression Analysis. Mediation effect of process variables between independent variables and overall success of Kaizen has been explained in section 5.13. Section 5.14 concludes the current chapter.

5.2 Background of Respondents and their Originations (Survey Result - Phase-II)

The respondents were mostly from Japanese based automobile sector organizations and their subsidiaries in Pakistan. They were grouped into three different categories: management side, supervisory staff, Kaizen team leaders and team members from shop floor workers. All respondents had at least 5 years' experience in the concerned organizations. It was ensured that the organizations selected for the circulation of survey questionnaires were implementing Kaizen tools and techniques in one form or another. In the present study, most of the respondents were male.

The selected organizations were located in all the four provinces of Pakistan i.e. Punjab, Sindh, Baluchistan, Khyber Pukhtoon Khawa (KPK) and the federal capital, Islamabad. Most of respondents were from Punjab (46.3%), followed by Sindh (38.9%), KPK (5.6%), Capital Area

Islamabad (7.5%) and Baluchistan (1.9%). The response rate of the organizations was 44.4%. The demography of the respondents organization including location, size in the form of number of employees, designation of respondents, experience of respondents in these organizations, type of product / services being provided by respondents organizations and competency level of employees on Kaizen tools and techniques were determined through statistical analysis of data collected through survey / interview. Details of results are given in succeeding paragraphs.

5.2.1 **Location of Respondents' Organization in Pakistan**

Result of statistical analysis regarding the location of respondents' organizations are shown in Table 5.1. The survey covers all four provinces as well as capital area of Pakistan. The results indicate that out of 54, finally selected respondent organizations, 25 (46.3%) organizations are from Punjab, 21 (38.9%) organizations are from Sindh, 3 (5.6%) organization are from Khyber Pukhtoon Khawa 4 (7.4%) are from Islamabad capital area and 1 (1.9%) organization is from Baluchistan province.

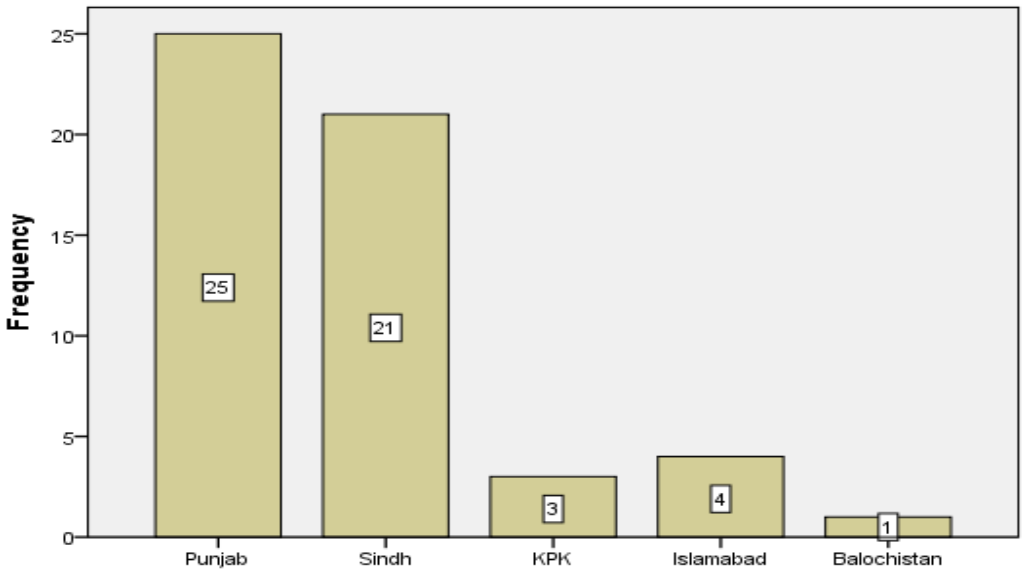


Table 5.1: Location of Respondent's Organizations in Pakistan

S/No	Province	Frequency	Percentage (%)	Cumulative Percentage (%)
1	Punjab	25	46.3	46.3
2	Sindh	21	38.9	85.2
3	KPK	3	5.6	90.7
4	Islamabad	4	7.4	98.1
5	Baluchistan	1	1.9	100.0
Total		**54**	**100**	

5.2.2 **Number of Employees of Respondents Organizations**

Table 5.2 shows survey results regarding number of employees (size) of the respondent organizations. Out of 54 respondent organizations, 12 (22.2%) have number of employees between 50 and 100. 23 (42.6%) organizations have number of employees from 100-150, 4 (7.4%) organizations have number of employees from 151-200, 7 (13%) organizations have number of employees between 200 and 250. Only 14.8% organizations i.e. 8 out of 173 organizations have number of employees more than 250.

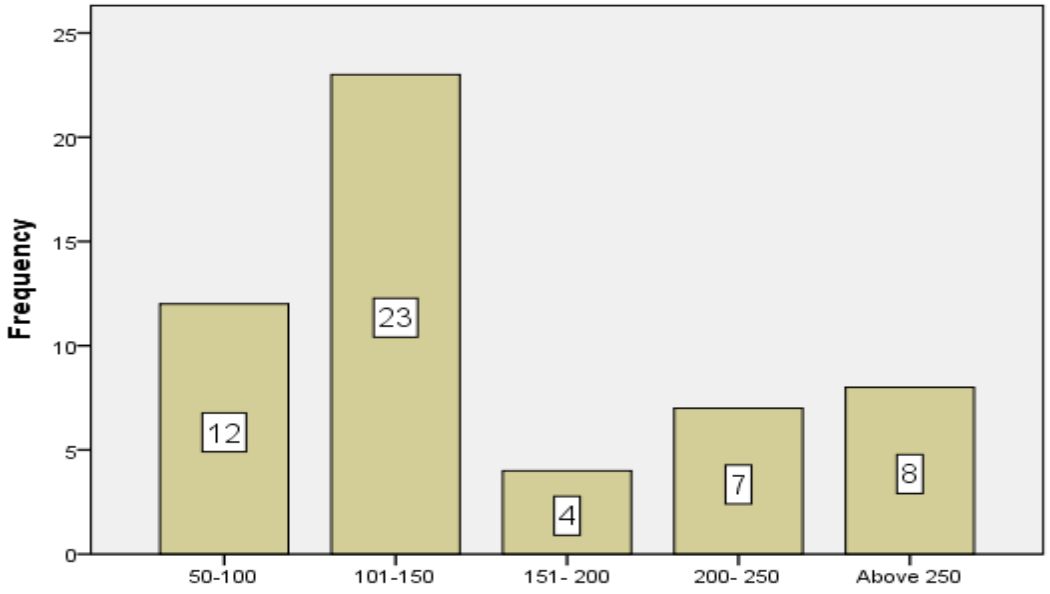


Table 5.2: Number of Employees of Respondent's Organizations

S/No	No of Employees	Frequency	Percentage (%)	Cumulative Percentage (%)
1	50-100	12	22.2	22.2
2	101-150	23	42.6	64.8
3	151- 200	4	7.4	72.2
4	201- 250	7	13.0	85.2
5	Above 250	8	14.8	100
Total		**54**	**100**	

5.2.3 **Designation of Respondents within Selected Organizations**

Survey results regarding the designation of respondents in selected organizations implementing Kaizen tools and techniques for continual improvement are presented in Table 5.3. The results of survey shows that 25 out of 173 (14.5%) respondents were general manager / production managers, 53 out of 173 (30.6%) respondents were Quality Managers, 49 out of 173 (28.3%) were Supervisors/ Kaizen facilitators and 46 out of 173 (26.6%) respondents were

Kaizen team leaders or Kaizen team members. The results indicate that most respondents are directly or indirectly involved in Kaizen activities being taking place in the organization.

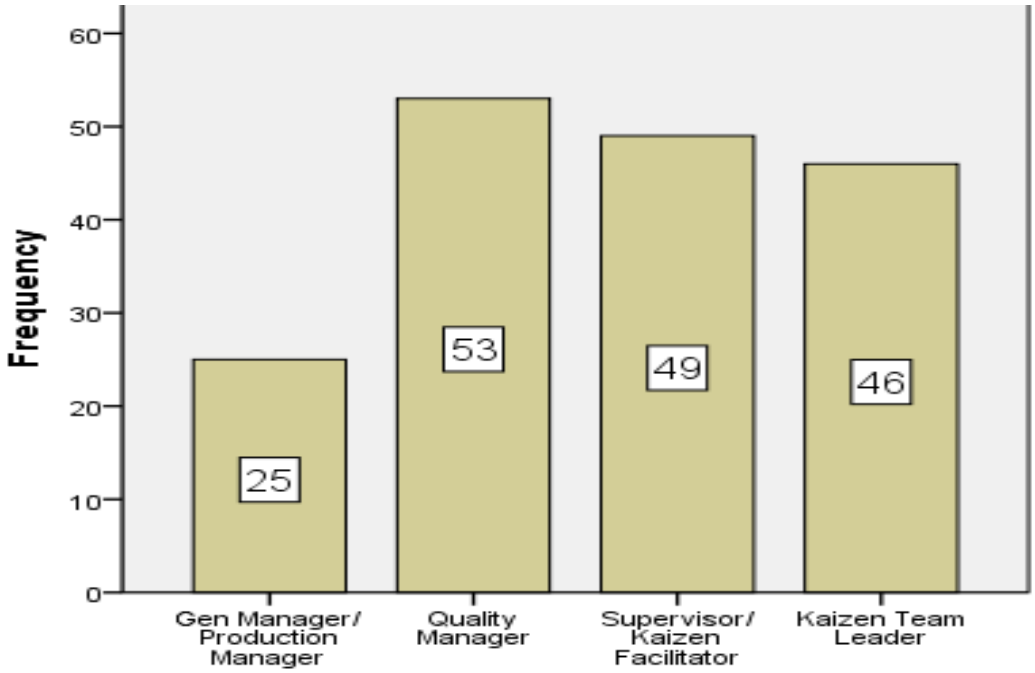


Table 5.3: Designation of Respondents within Selected Organizations

S/No	Designation	Frequency	Percentage (%)	Cumulative Percentage (%)
1	General Manager/ Production Manager	25	14.5	14.5
2	Quality Manager	53	30.6	45.1
3	Supervisor/ Kaizen Facilitator	49	28.3	73.4
4	Kaizen Team Leaders / Team Members	46	26.6	100
Total		**173**	**100**	

5.2.4 Experience of Respondents

Survey results regarding experience of respondents in selected organizations implementing Kaizen tools and techniques for continual improvement of their organization are shown in Table 5.4.

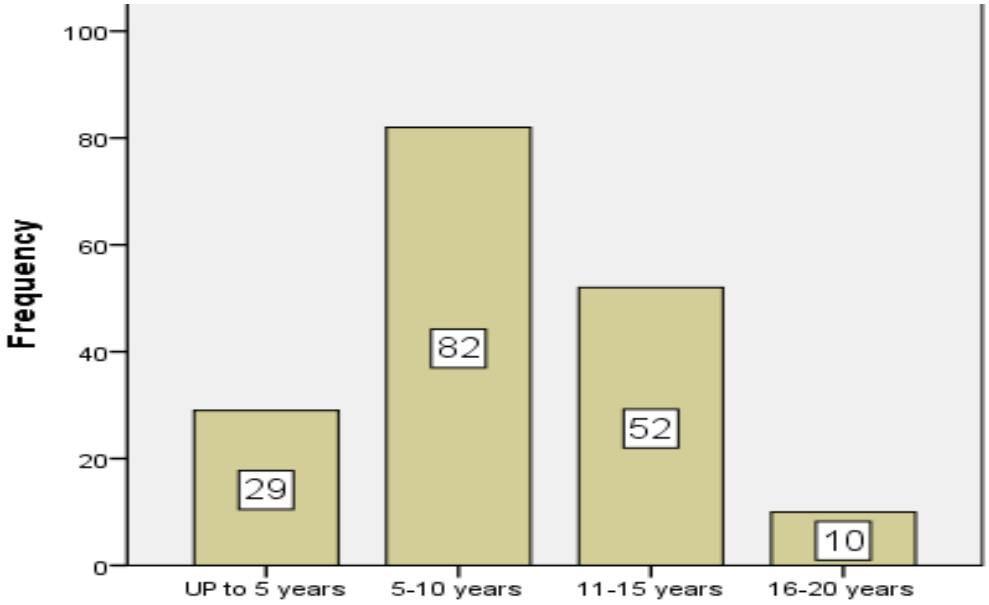


Table 5.4: Experience of Respondents.

S/No	Service in years	Frequency	Percentage (%)	Cumulative Percentage (%)
1	Up to 5 years	29	16.8	16.8
2	5-10 years	82	47.4	64.2
3	11-15 years	52	30.1	94.2
4	16-20 years	10	5.8	100
Total		**173**	**100**	

The results show that 29 out of 173 (16.8%) respondents have served up to 5 years, 82 out of 173 (44.4%) respondents have served from 5-10 years, 52 out of 173 (30.1%) respondents have served from 11-15 years, and 10 out of 173 (5.8%) respondents have served from 16-20 years in their present organizations. The survey results indicate that all the respondents have 2-3 years' experience in present organization to perceive Kaizen activities in a better way and to respond to the survey questions regarding Kaizen implementation in their organization most effectively.

5.2.5 Types of Products / Services being provided by the Respondent Organizations

Survey results regarding type of products / services being provided by respondent's organizations implementing Kaizen tools and techniques for CI of their organization are shown in Table 5.5.

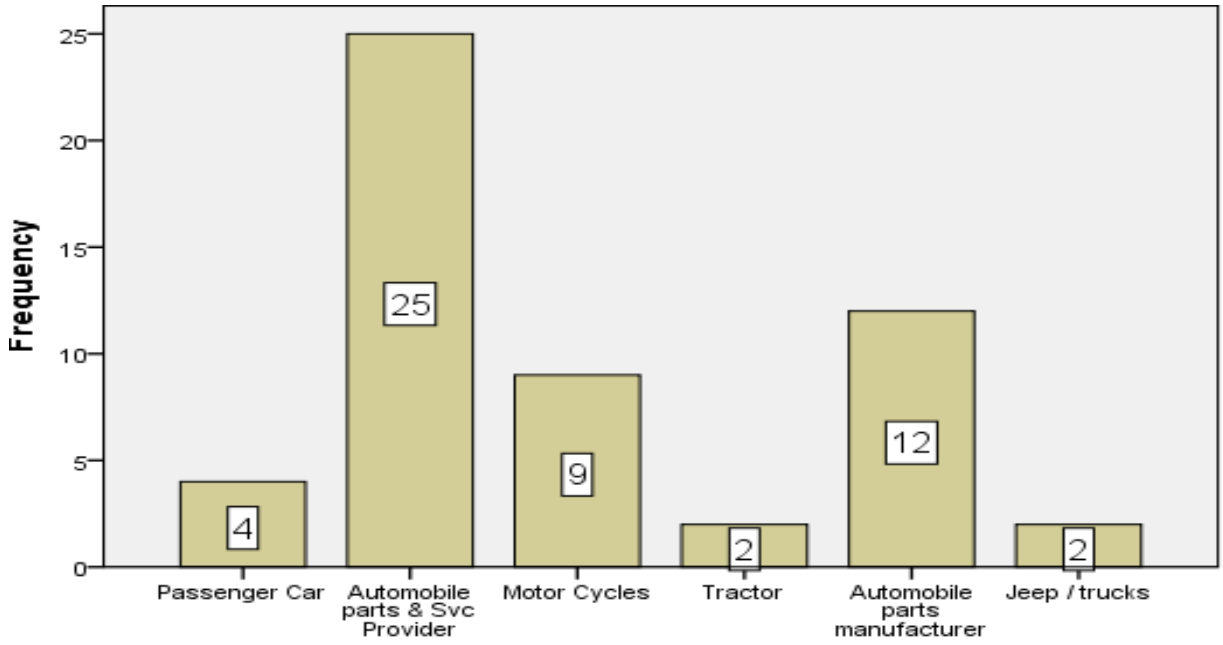


Table 5.5: Classification of Product / Service being provided

S/No	Type of Product	Frequency	Percentage (%)	Cumulative Percentage (%)
1	Passenger cars	4	7.4	7.4
2	Automobile service provider	25	46.3	53.7
3	Motor Cycles/ Rickshaw	9	16.7	70.4
4	Automobile parts manufacturer	12	22.2	92.6
5	Tractor	2	3.7	96.3
	Jeeps	2	3.7	100
Total		**54**	**100**	

According to survey results, out of 54 respondent organizations, 4 (7.4%) organizations are producing passenger cars, 9 (16.7%) organizations are producing motor cycles/ rickshaws, 25 (46.3%) organizations are automobile parts and service provider, 2 (3.7%) organizations are manufacturing tractors, 12 (22.2%) organizations are only automobile parts manufacturers and 2 (3.7%) organizations are producing jeeps / trucks.

5.3 Aggregation of Individual Level Mean Response to an Organizational Level Mean Response

After data screening and confirmation of construct validity and internal reliability of the survey scale items in chapter 4, the data was prepared for statistical analysis to develop regression model. Before preparing data for regression analysis, individual level survey response was checked to see if it can be aggregated to an organizational level response, as the survey

measures were designed to reflect the organizational level response. During the survey, individual respondent's perception was measured to collect the data independently. However, the survey was designed to measure the organizational level properties (organization was used as the unit of reference in all survey questions). As per Chan and Quazi (2002), this method is known as "referred shift" composition model. If the measures work as design they are really measuring shared organizational properties, and that means there should be more variation across the organizations than within organizations. As per Bliese (2000), if variables under study are truly shared by the respondents at organization level then organization level mean response value will show more reliable results than individual level response.

Statistical tools such as one way ANOVA was used to check the aggregation of survey response to an organizational level using data collected at individual level. Results of statistical tool such as one way ANOVA with organization as the main effect must be significant for aggregation of individual level mean response to an organizational level mean response. Furthermore, there should be relatively high degree of consensus among respondents within an organization, measured by analyzing the extent of iterator agreement. If these conditions are fulfilled, then individual level response can be aggregated to an organization level mean score of the variables of interest.

The results of ANOVA for independent, dependent and process variables are summarized in Table 5.6. If the p value is less than critical value ($\alpha = 0.05$), then the effect is said to be significant; otherwise it will be non-significant. The "α" value is normally set as 0.05, i.e. 95 % confidence interval level and $\alpha = 0.01$ for 99% confidence interval. Any ***p*** value less than 0.05 will be considered as significant. Whereas on the other hand ***p*** value greater than critical (α) value i.e. 0.05 will be considered as non-significant value.

Table 5.6: Results of ANOVA and Values of Interaclass Correlation of Survey Scale Items

Scale/ Items	MSW	MSB	F Value	P Value	ICC(I) Value
Independent Variables (IV)					
Top Management Commitment	1.109	0.609	2.446	**0.032**	0.35
Organization Kaizen Culture	0.923	0.609	1.940	**0.047**	0.40
Personal Initiative	0.767	0.581	2.109	**0.034**	0.43

Rewards and Recognition	0.895	0.584	2.012	**0.041**	0.39
Training of Workers	1.247	0.874	1.952	**0.050**	0.41
Kaizen Event and Team Design	0.650	0.415	1.978	**0.049**	0.39
Process Variables (PV)					
Employees Commitment to Kaizen	0.043	0.057	2.595	**0.024**	0.57
Action Oriented Kaizen	0.971	0.420	1.203	0.312	0.30
Employees Knowledge about Kaizen Tools and Techniques	0.092	0.0592	1.785	**0.077**	0.39
Standardization of Organizational Internal Process	0.044	0.0468	1.248	**0.028**	0.52
Outcome / Dependent Variables (DV)					
Human Resource Development	0.016	0.034	2.072	**0.037**	0.68
Work Area Improvement	0.017	0.034	2.042	**0.040**	0.67
Organizational Internal Process Improvement	0.018	0.032	1.941	0.051	0.64
Product Quality Improvement	0.019	0.055	2.961	**0.004**	0.74
Overall Success of Kaizen	0.031	0.024	1.957	**0.047**	0.44

According to Granja, Picchi, & Robert, (2005), method used to evaluate the appropriateness of aggregation is to calculate the value of Intraclass correlation coefficient. As per Bliese (2000), Intraclass correlation coefficient can be defined as the measure of lower level of variance that can be explained by a group members of an organization. Its value ranges between ±1. According to Granja et al., (2005), there are two types of Intraclass correlation coefficient measures in use, for organizational research:-

a. The first one is a classical measure which is used in statistics and social science research, e.g. (Kenny & La Voie, 1985). There values are calculated from mean square resulting from ANOVA and varies from -1 to +1. The ICC value is negative when variance within organization exceeds then variance between organizations such that ICC (1) is really a measure of the difference between organizations mean square and within organizations mean square from ANOVA.

b. The second ICC (1) measure is calculated from variance component resulting from an unconditional means value only (random effect model) and is commonly used in conjunction with Hierarchical Linear Modeling (HLM) (Raudenbush & Bryk, 2002). This type of ICC calculation is more direct than calculation of the portion of total level of specific variation between organizations plus within organization variation for the given level of analyses that can be accounted for by organizations respondents.

Although both measure the same attributes but they use different scales. The variance component formulation varies from 0 to 1 only (0 when there is no variance between organizations is attained and +1 when total variance within organization exceeds from variance value between organizations). ICC is calculated through ANOVA by using mean square values. The formula for the calculation of Intraclass correlation coefficient as given by (Li, 2013) shown in equation 5.1.

$$\mathrm{ICC}(1) = \frac{\mathrm{MSB}}{[\mathrm{MSB}+(\mathrm{k}+1)*\mathrm{MSW}]}, \tag{5.1}$$

Where

MSB = variance between respondent's organizations.

MSW = variance within respondent organizations

K = Average numbers of respondents from each organization

The results of ANOVA and Intraclass correlation coefficient achieved during this research are shown in Table 5.8. As per Klein and Kozlowski (2000), significant ANOVA value with group as the main effect provides justification for the aggregation of individual level response into an organization level response. The results show that the ANOVA value is significant having critical value of p less than 0.05 for most of the research variables, which means there is no significant difference between organization level mean response value and individual level mean response value within an organization. Furthermore, larger ICC values indicate more homogeneity within organization on the measure of variables of interest. Although there is no clear limit for the values of Intraclass correlation coefficient, value of ICC must be large enough to justify aggregation (Schneider et al., 1998). As a rule of thumb, values of ICC

greater than 0.1 are often considered as good values for the aggregation of individual level response into an organizational level response (Schneider, 1998; James 1982; Molleman, 2005). Table 5.8 shows that the values of Intraclass correlation coefficient (ICC) lie between 0.1and 0.5 with no negative values.

Although, results of ANOVA and Intraclass correlation coefficient indicate that at an individual level mean response can be aggregated to an organizational level mean response; however, theoretical rationale for doing so has also been established. In this research all survey scale items were developed keeping in view organization as a unit of interest and hypotheses were also developed at organization level. Therefore, the aggregation of data from individual level mean response to an organization level mean response can be done and subsequent analyses will be carried out on this aggregated organization level mean response data.

5.4 Descriptive Statistics of Organizational Level Response

Organizational level data was calculated by finding mean value of individual level response of all respondents from the same organization. Thus the responses from 173 respondents of 54 different organizations are summarized as 54 mean response values. Different tools from SPSS software were applied to test the hypotheses and get the results of the statistical analysis. The detail of the **tools used** to confirm the hypotheses in this research study is given as follows:

a. **ANOVA:** To aggregate the individual level response to an organization level response ANOVA from SPSS was applied.

b. **Descriptive statistic using SPSS:** To find out mean, standard deviation, minimum maximum values, Skewnes & Kurtosis for normality checking of data and sample size of the data, descriptive statistics was applied.

c. **Bivariate Correlational Coefficient through Pearson Correlation Method:** To identify correlation between independent and dependent variables, process and dependent variables of Kaizen, correlation coefficient was calculated using Pearson correlation coefficient method.

d. **Standards Linear Regression Analysis:** Backward selection and enter method was adopted to develop regression models for each outcome variable of Kaizen.

e. **Multiple Regression Analysis:** To test the mediation effect of process variable between independent variables and overall success of Kaizen in an organization hierarchical multiple regression analysis method was used.

Detail of all these tools used to analyze the data for confirmation of hypothesis along with results achieved through analysis are given in succeeding sections of the research study.

5.4.1 Descriptive Statistics for Independent Variables

The descriptive statistics of organizational responses related to independent variables, process variables and outcome variables of Kaizen are given in Annexure E to G of this report. The result of descriptive statistics for independent variables shows that the mean values for independent variables, i.e. TMC is 4.04 having maximum value 4.45 and minimum value 3.73. These values indicate that respondents agree with statement of scale items. Mean value for OKC is 4.18 having maximum value 4.55 and minimum value 3.87. For personal initiative mean value is 4.12 with maximum value 4.45 and minimum value 3.73. Rewards and recognition have mean value 4.08, maximum value 4.4 and minimum value 3.67. Mean value for TOW is 4.04 having maximum value 4.5 and minimum value 3.62, whereas average value for KETD is 3.91 having maximum value 4.17 and minimum value 3.67.

The highest value from all scale items was 5 which means the respondent strongly agrees with the statement, whereas minimum value zero means that respondents strongly disagree with the statement of survey scale item. The mean values of each independent variable indicate that the respondents from these organizations generally agree with the statement of scale items related to each variable.

5.4.2 Descriptive Statistics for Process Variables

The detail results of descriptive statistics for process variables are shown in Annexure F of this report which indicates that the mean values for process variables i.e. employees commitment to Kaizen is 3.83 with maximum value of 4.35 and minimum value of 3.6. For action-oriented Kaizen mean value is 3.88 with maximum value 4.25 and minimum value 3.6. For employees' knowledge of Kaizen tools and techniques mean value is 3.89 with maximum value 4.33 and minimum value 3.5, whereas average values for standardization of organizational internal process is 3.95 with maximum value 4.3 and the minimum value is 3.6. The highest level

of agreement that strongly agrees with the statement of scale item has value of 5. So, the mean value of process variables of Kaizen indicates that generally the respondents agree with the statement of the survey scale items related to process variables of Kaizen.

5.4.3 Descriptive Statistics for Outcome Variables

The detail results of descriptive statistics for outcome variables of Kaizen are presented in Annexure G. The results show that the mean values for outcome variable 'human resources development' is 4.08 having maximum value 4.5 and minimum value 3.83. Mean value for work area improvement is 3.95 having maximum value 4.31 and minimum value 3.67. For organization internal process improvement mean value is 3.88 having maximum value 4.2 and minimum value 3.6. Mean value for product quality improvement is 3.93 having maximum value 4.35 and minimum value 3.6 and the value for overall success of Kaizen is 3.93 having maximum value 4.33 and minimum value is 3.73.

The highest level of scale value for dependent variable was 5 which mean the respondent strongly agrees with the statement of survey scale items. The average value of outcome variables of Kaizen indicates that generally the respondents agree with the statement of survey scale items related to dependent variables of Kaizen in an organization such as human resources development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in an organization.

5.5 Testing of Hypotheses

Pearson's correlation, multiple regression analyses and hierarchical multiple regression analysis methods were used to test the hypotheses formulated earlier in section 3.15. Hypotheses H1a to H1dd and H2a to H2t were tested through Pearson correlation test, finding correlation Coefficient values between each independent and dependent variable, as well as between each process and dependent variable of Kaizen. According to Sheskin (1997), if variables are measured in ratio / interval scale then Pearson correlation coefficient test is more suitable to measure the relationship between two variables (Furlong, Lovelace, & Lovelace, 2000). Hypotheses H3 to H5 were tested through multiple regression analysis. Multiple regression analysis identifies the effects of more than one variables on each dependent variable of Kaizen.

The Pearson correlation coefficient value shows strength of association between each independent and dependent variable of Kaizen. Whereas multiple regression analysis shows maturity level as well as strength of the relationship among the number of predictors and each criterion variable by allowing prediction on the strength of the relationship between predictors (input variables) and criterion (outcome variable) of Kaizen. The useful and common method, which describes the strength of relationship between two variables, is known as correlation coefficient (C. Li, 2011). The Pearson correlation between series of "*N*" measurement of two variables *x* and *y* written as x_i and y_i is given by (Farris et al, 2006), where $i = 1, 2 \ldots.n$, is shown in equation 5.2.

$$r_{xy} = \frac{\sum_{i=1}^{n}(xi-\bar{x})(yi-\bar{y})}{(n-1)\sigma_x\sigma_y}, \quad (5.2)$$

Where

$\bar{x}$ is sample mean of value of *x* variable and $\bar{y}$ is a sample mean of value of y variable.

σ_x is the standard deviation of sample *x* and σ_y is the standard deviation of sample y

Whereas n is the number of pairs of values of variable x and y.

During the hypothesis testing, if the correlation coefficient values between sample variables x and *y* is significant then same value can be inferred as correlation coefficient values between variable *x* and *y* at population level. At normal conditions the null hypothesis says that the correlation coefficient value (r) for paired variables *x* and *y* of population is equal to zero or less than critical value. Testing of hypotheses depend on critical value i.e. *p* value for each Pearson correlation coefficient value. Lesser the value of *p* than critical value, higher will be the value of correlation coefficient, which means more chances that alternate hypothesis is accepted and null hypothesis is rejected.

5.5.1 **Testing of Hypothesis H1**

Pearson correlation coefficient method was used to test the hypotheses H1a to H1dd. The null hypothesis says that each independent variable of Kaizen has no association with each dependent variable of Kaizen. The alternate hypothesis will be that each independent variable has association with each dependent variable of Kaizen. Pearson's correlation Test was

performed to identify the strength of relationship between each IV of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, rewards and recognition, training of workers, Kaizen event & team design with each DV of Kaizen i.e. human resources development, work area improvement, organization internal process improvement, product quality improvement, and overall success of Kaizen. As per Pallant (2005), the lowest value of Pearson correlation coefficient is 0, which means that there is no relationship, while the highest value of correlation is ±1.0 shows that there is a strong or perfect positive or negative correlation between the pair of variables. Cohen & Bailey, (1997) suggested that when the value of Pearson correlation is from ± 0.1 to ± 0.29, then the relationship between two variables is known as a weak relationship. However, when the value of Pearson correlation is from ± 0.30 to ± 0.49, then the strength of this relationship is known as medium type relationship. When the value of Pearson correlation is ≥ 0.5 then the strength of relationship between variables is strong enough. As per Sheskin (1997), the correlation values from 0.3 to 0.69 are referred as moderate and those equal to or greater than 0.7 are referred as a strong correlation between two variables.

The results of the Pearson correlation test carried out during this study to find out the relationship between each independent and dependent variable of Kaizen are shown in Table 5.7 below. The values of Pearson correlation coefficient indicated with "*" show the relationship is significant at critical value of 0.05 and 95% confidence level interval, similarly the correlation coefficient value indicated by "**" show that the relationship is significant at critical value 0.01, and 99% confidence level interval.

Table 5.7: Two Tailed Pearson Correlation Coefficient Values (when N= 54)

IV / DV		**HRD**	**WAI**	**OIPI**	**PQI**	**OSK**
TMC	Pearson Correlation	.791**	.596**	.638**	.748**	.700**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
OKC	Pearson Correlation	.616**	.536**	.580**	.699**	.503**
	Sig. (2-tailed)	.000	.000	.000	.000	.001
PI	Pearson Correlation	.668**	.688**	.617**	.644**	.673**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
RR	Pearson Correlation	.681**	.664**	.650**	.515**	.650**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

TOW	Pearson Correlation	.638**	.760**	.723**	.617**	.680**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
KETD	Pearson Correlation	.590**	.413**	.558**	.542**	.539**
	Sig. (2-tailed)	.000	.002	.000	.000	.000

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

5.5.1.1 **Testing of Hypotheses H1a to H1e**

H0a to H0e: Independent variable "top management commitment" has no significant association with outcome variables, e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in an organization.

From Table 5.7, Pearson correlation coefficient values, 0.791, 0.748 and 0.700, show a strong association of top management commitment with HRD, PQI and OSK, respectively, whereas it has moderate type of association with work area improvement having correlation coefficient value 0.596 and organizational internal process improvement having correlation coefficient 0.638. Overall, the association of top management commitment with all outcome variables is positive and it is ranging from moderate to strong enough. The result also indicates that *p* values for all dependent variables is less than critical values of 0.05, showing that null hypothesis is rejected whereas alternate hypothesis H1a to H1e are accepted. This mean that at organizational level independent variable top management commitment has moderate to strong correlation with all outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. Schematically this relationship is shown in Figure 5.1a-e.

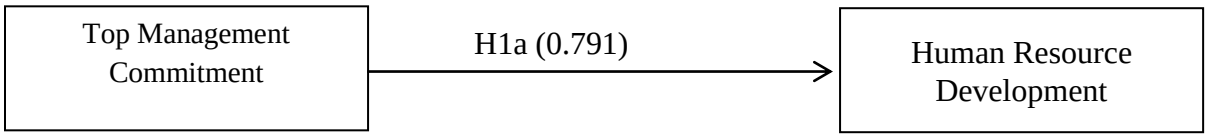


Figure 5.1a: Pearson correlation coefficient values showing strength of correlation between TMC and HRD

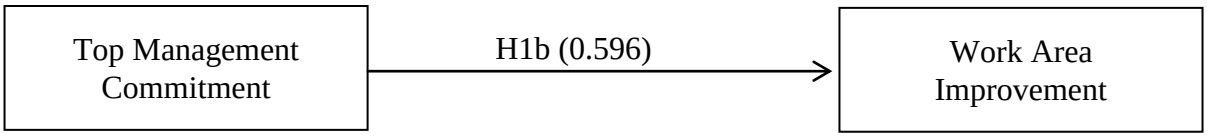


Figure 5.1b: Pearson correlation coefficient values showing strength of correlation between TMC and WAI

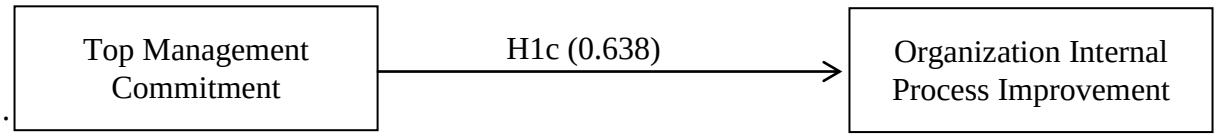


Figure 5.1c Pearson correlation coefficient values showing strength of correlation between TMC and OIPI.

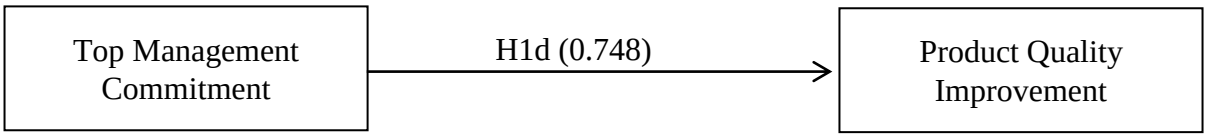


Figure 5.1d: Pearson correlation coefficient values showing strength of correlation between TMC and PQI

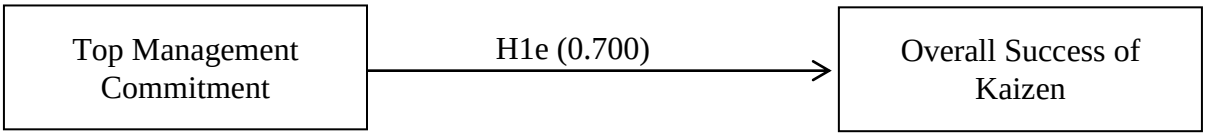


Figure 5.1e: Pearson correlation coefficient values showing strength of correlation between TMC and OSK.

5.5.1.2 **Testing of Hypotheses H1f to H1j**

H0f to H0j: Independent variable "organization Kaizen culture" has no significant association with outcome variables e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

The results from Pearson correlation test indicates that independent variable organizational Kaizen culture has moderate strength of correlation with outcome variables of effective implementation of Kaizen in the form of human resource development, product quality improvement, work area improvement organizational internal process improvement and overall success of Kaizen. The Pearson correlation coefficient values showing strength of correlation of IV of Kaizen culture with outcome variables of Kaizen i.e. HRD, WAI, OIPI, PQI, and OSK are

0.616, 0.536, 0.580, 0.699, and 0.503 respectively; whereas, p values for each relationship is less than critical value of 0.05 showing (significant correlation) coefficient value. Thus, the null hypotheses are rejected while the alternate hypotheses H1f to H1j are accepted. This means that at organization level, independent variable "organization Kaizen culture" (OCK) has moderate correlation with outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. The schematic view of this relationship is shown as in Figure 5.2a-e.

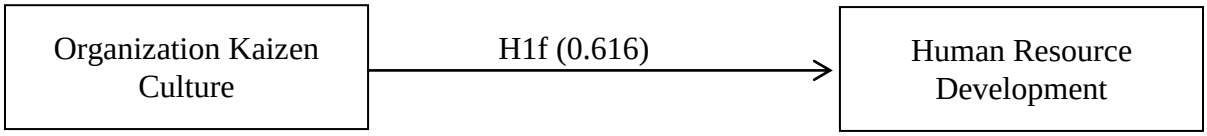


Figure 5.2a: Pearson correlation coefficient values showing strength of correlation between OKC and HRD

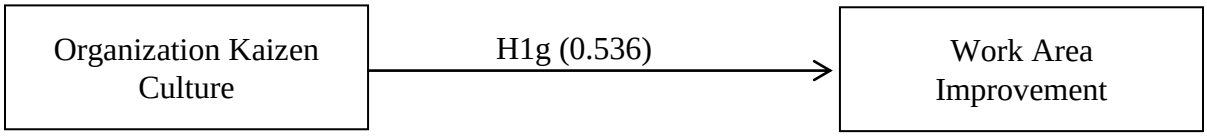


Figure 5.2b: Pearson correlation coefficient values showing strength of correlation between OKC and WAI

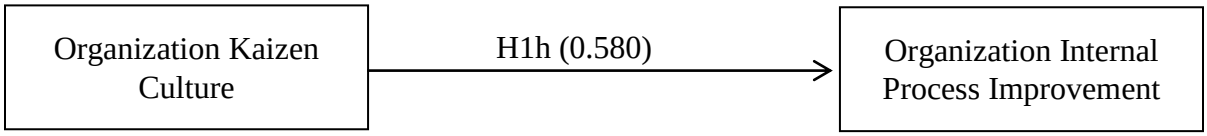


Figure 5.2c: Pearson correlation coefficient values showing strength of correlation between OKC and OIPI

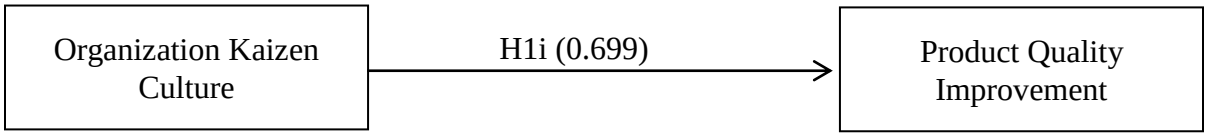


Figure 5.2d: Pearson correlation coefficient values showing strength of correlation between OKC and PQI

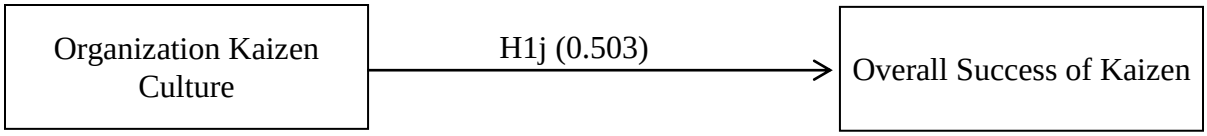


Figure 5.2e: Pearson correlation coefficient values showing strength of correlation between OKC and OSK

5.5.1.3 **Testing of Hypotheses H1k to H1o**

H0k to H0o: Independent variable "personal initiative of employees" has no significant association with outcome variables e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

Pearson correlation coefficient values shown in Table 5.7 indicates moderate type association of "personal initiative" with human resource development, work area improvement, organizational internal process improvement, product quality improvement and overall success of Kaizen having Pearson's correlation coefficient value 0.668, 0.688, 0.617, 0.644 and 0.673, respectively, whereas *p* values for all outcome variables is less than critical value of 0.05, showing significant correlation of PI with all outcome variables of effective implementation of Kaizen. It means null hypothesis H0k to H0o are rejected whereas alternate hypothesis H1k to H1o shown in Table 3.12 are accepted. This means that at an organization level, independent variable Personal initiative taken by the employees of the organization has moderate correlation with outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. Schematically this relationship is shown in Figure 5.3a-e.

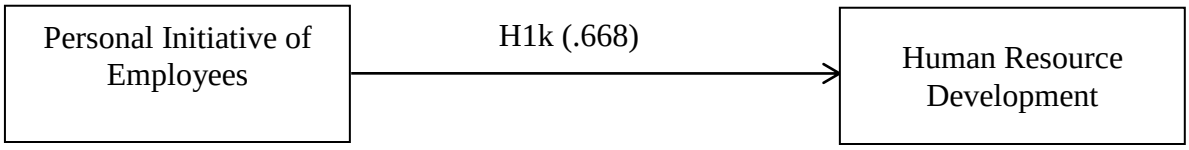


Figure 5.3a: Pearson correlation coefficient values showing strength of correlation between PI and HRD

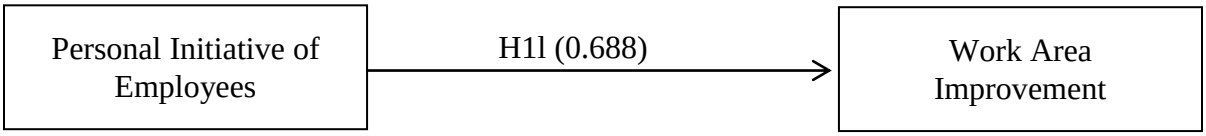


Figure 5.3b: Pearson correlation coefficient values showing strength of correlation between PI and WAI

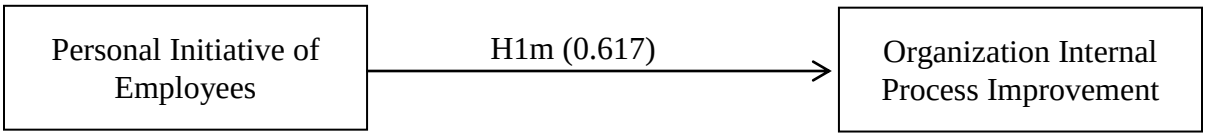


Figure 5.3c: Pearson correlation coefficient values showing strength of correlation between PI and OIPI

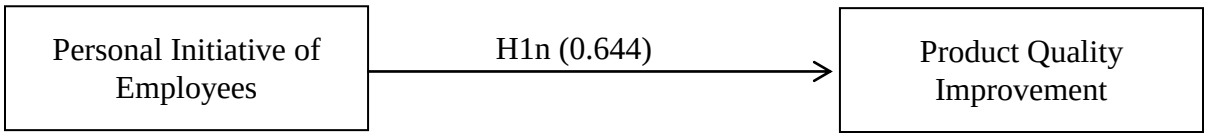


Figure 5.3d: Pearson correlation coefficient values showing strength of correlation between PI and PQI

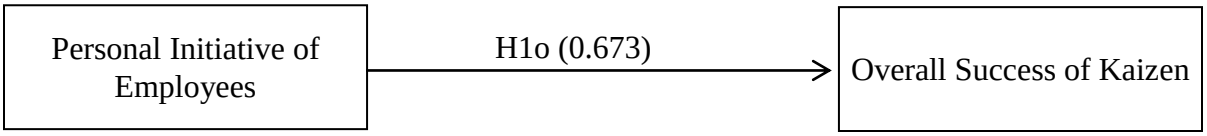


Figure 5.3e: Pearson correlation coefficient values showing strength of correlation between PI and OSK

5.5.1.4 **Testing Hypotheses H1p to H1t**

H0p to Hot: Independent variable "rewards and recognition" has no significant association with outcome variables e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

Pearson correlation coefficient values shown in Table 5.7 for independent variable rewards and recognition show their moderate type strength of association with the outcome variables of Kaizen such as human resource development (0.681), work area improvement (0.664), organizational internal process improvement (0.650), product quality improvement (0.514) and overall success of Kaizen (0.650). The p value for each outcome variable is less than the critical value (0.05) showing that null hypothesis is rejected whereas alternate hypothesis H1p to H1t given in Table 3.12 are accepted. This means that at organization level independent variable rewards and recognition given to the employees of the organization has moderate correlation with outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. The schematic view of this relationship is shown in Figure 5.4 a-e.

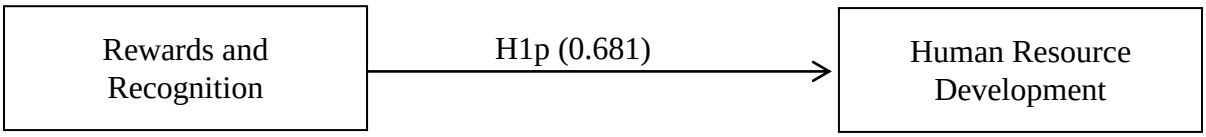


Figure 5.4a: Pearson correlation coefficient values showing strength of correlation between RR and HRD

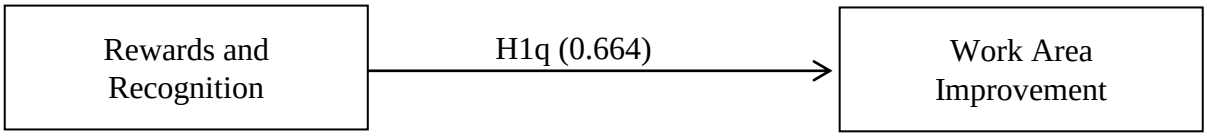


Figure 5.4b: Pearson correlation coefficient values showing strength of correlation between RR and WAI

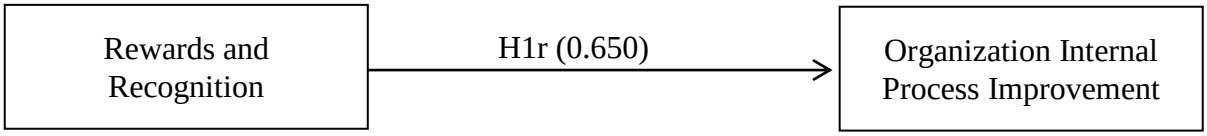


Figure 5.4c: Pearson correlation coefficient values showing strength of correlation between RR and OIPI

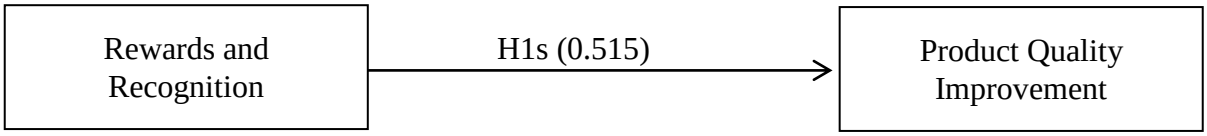


Figure 5.4d: Pearson correlation coefficient values showing strength of correlation between RR and PQI

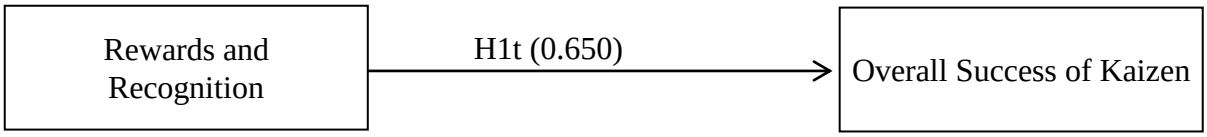


Figure 5.4e: Pearson correlation coefficient values showing strength of correlation between RR and OSK

5.5.1.5 **Testing of Hypotheses H1u to H1y**

H0u to H0y: Independent variable "Training of workers" has no significant association with outcome variables e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

Results of Pearson correlation coefficient test for independent variable, training of workers indicate their strong association with the outcome variables of effective implementation of Kaizen such as human resource development (0.638), work area improvement (0.760),

organizational internal process improvement (0.723), product quality improvement (0.617) and overall success of Kaizen (0.680) having correlation coefficient values as shown against each. *p* value for each outcome variable is less than critical value of 0.05, which shows that correlation is significant at 95% confidence interval level. Result shows that the null hypothesis is rejected whereas alternate hypothesis H1u to H1y shown in Table 3.12 are accepted. This means that at organization level independent variable training of workers has strong correlation with outcome variables of Kaizen such as HRD, WAI, OIPI, and OSK whereas moderate type correlation with PQI. Schematically this relationship is shown in Figure 5.5 a-e.

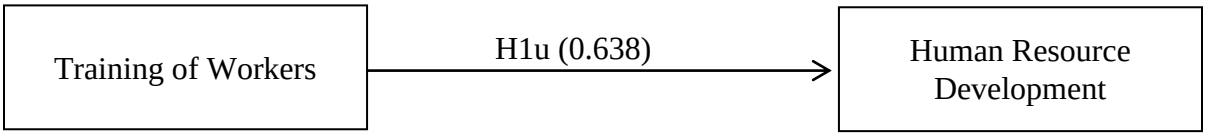


Figure 5.5a: Pearson correlation coefficient values showing strength of correlation between TOW and HRD

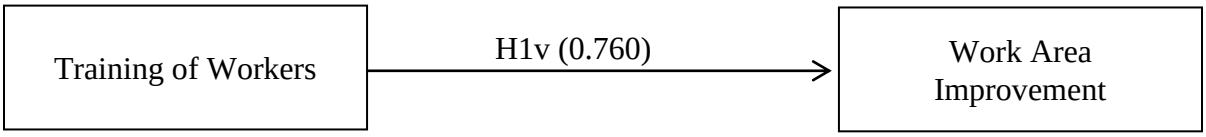


Figure 5.5b: Pearson correlation coefficient values showing strength of correlation between TOW and WAI

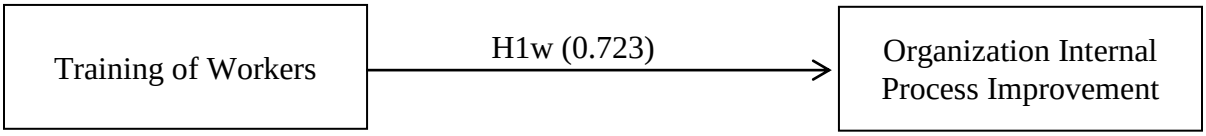


Figure 5.5c: Pearson correlation coefficient values showing strength of correlation between TOW and OIPI

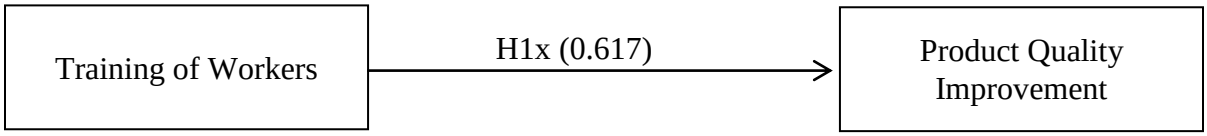


Figure 5.5d: Pearson correlation coefficient values showing strength of correlation between TOW and PQI

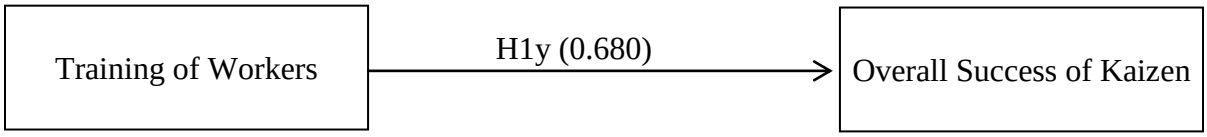


Figure 5.5e Pearson correlation coefficient values showing strength of correlation between TOW and OSK

5.5.1.6 **Testing of Hypotheses H1z to H1dd**

H0z to H0dd: Independent variable "Kaizen event & team design" has no significant association with outcome variables e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

The results of Pearson correlation test shown in Table 5.7, indicate that independent variable "Kaizen event and team design" has moderate type relationship with the outcome variables of effective implementation of Kaizen, i.e. human resource development (0.590), work area improvement having correlation coefficient value (0.413), organizational internal process improvement (0.558), product quality improvement (0.542) and overall success of Kaizen (0.539) having correlation coefficient values as shown against each. The p values for all outcome variables are less than the critical value of 0.05, which mean that correlation between independent variable KETD and outcome variable of Kaizen is significant at 95% confidence interval level. Overall results of Pearson correlation coefficient analysis reject the null hypothesis and accept alternate hypotheses H1z to H1dd which indicate that the independent variable KETD has moderate type association with outcome variables of Kaizen. This means that the hypotheses H1z-H1dd shown in Table 3.12 have been accepted. The schematic view of relationship is shown in Figure 5.6 a-e.

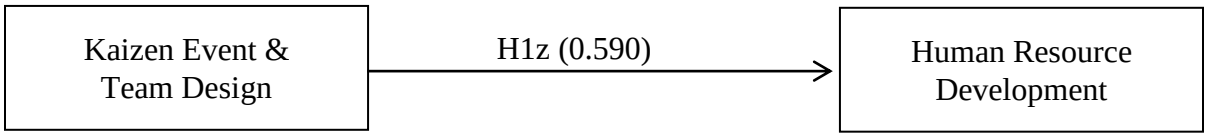


Figure 5.6a: Pearson correlation coefficient values showing strength of correlation between KETD and HRD

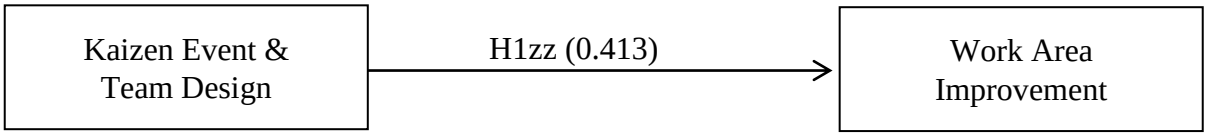


Figure 5.6b: Pearson correlation coefficient values showing strength of correlation between KETD and WAI

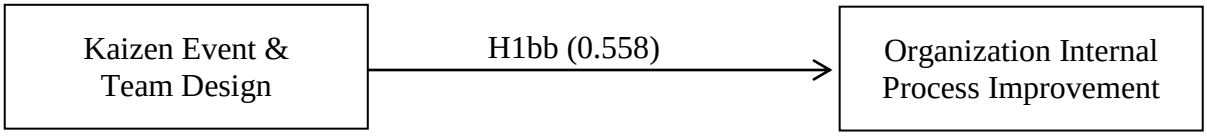


Figure 5.6c: Pearson correlation coefficient values showing strength of correlation between KETD and OIPI

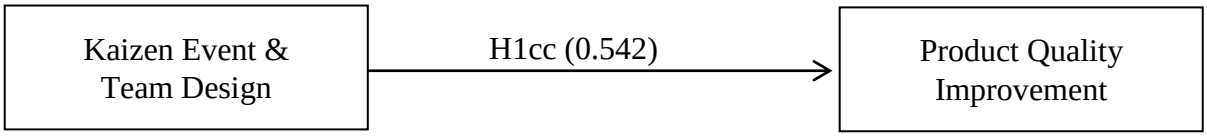


Figure 5.6d: Pearson correlation coefficient values showing strength of correlation between KETD and PQI

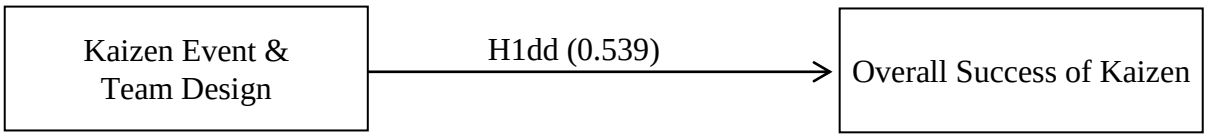


Figure 5.6e: Pearson correlation coefficient values showing strength of correlation between KETD and OSK

5.5.1. **Overall Result of Pearson Correlation Test**

Overall results of Pearson correlation coefficient analyses prove that at organization level all the IVs have moderate to strong association with each outcome variable of Kaizen. Schematically this relationship is shown in Figure 5.7.

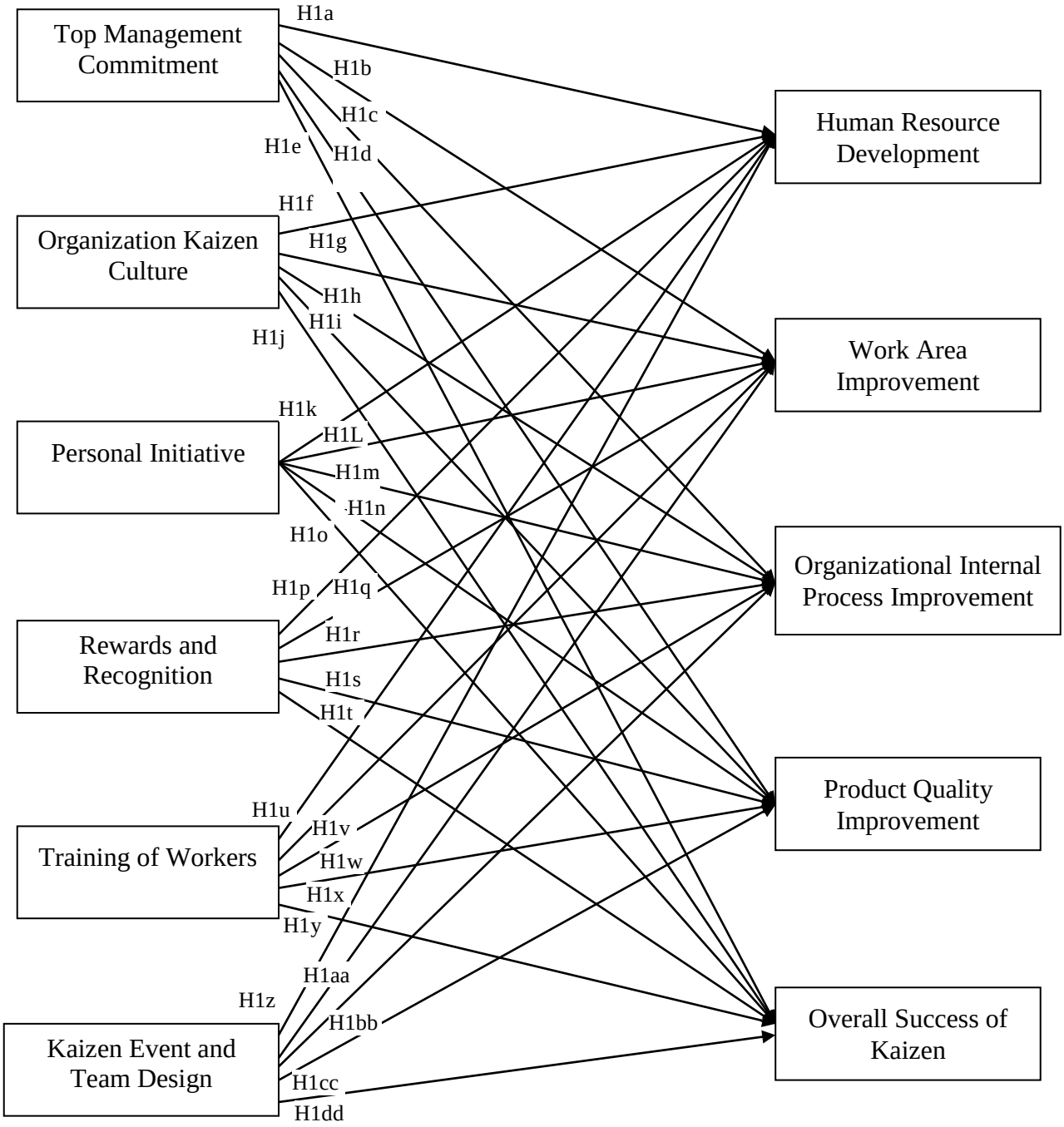


Figure 5.7 Schematic view of relationship between IVs and DVs of Kaizen

5.5.2 **Testing of Hypothesis H2**

H2a to H2t: Hypothesis H2a to H2t were tested through Pearson correlation coefficient values. Both process variables as well as outcome variables of Kaizen were measured in ratio or interval scale. As per Sheskin (1997), Pearson correlation method is suitable to test the hypothesis.

Pearson correlation coefficient values between each process and outcome variable of Kaizen have been determined through Pearson correlation test. The results of Pearson correlation coefficient test are shown in Table 5.8.

Table 5.8: Pearson Correlation Test Result for Process Variables

		HRD	**WAI**	**OIPI**	**PQI**	**OSK**
ECK	Pearson Correlation	.808**	.620**	.689**	.746**	.693**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
AO	Pearson Correlation	.692**	.707**	.681**	.646**	.589**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
EKTT	Pearson Correlation	.551**	.278*	.564**	.586**	.593**
	Sig. (2-tailed)	.000	.042	.007	.000	.003
SOIP	Pearson Correlation	.744**	.614**	.704**	.618**	.677**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

On the basis of results of Pearson correlation test different sub-hypotheses derived from hypotheses H2 were tested. Detail of confirmation of hypotheses is given as follows:

5.5.2.1 **Testing of Hypothesis H2a to H2e**

H0a to H0e: Process variable "Employees commitment to Kaizen" has no significant association with outcome variables of Kaizen e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

Pearson correlation coefficient values from the Table 5.8 show that employees commitment to Kaizen having Pearson correlation coefficient values 0.808, 0.746 and 0.693 were strongly associated with outcome variables, i.e. human resource development, product quality improvement and overall success of Kaizen. Moreover, it has moderate association with work area improvement and organizational internal process improvement having Pearson correlation coefficient values 0.620 and 0.689 respectively. The significant or "*p*" values for all outcome variables of Kaizen are less than the critical value of 0.05 which shows significant

correlation between employee's commitment to Kaizen and DV of Kaizen. Hence, null hypotheses are rejected and alternate hypothesis H2a to H2e are accepted. It means that the process variable employee's commitment to Kaizen has a strong relationship with outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. Schematically this relationship is shown in Figure 5.8 a-e.

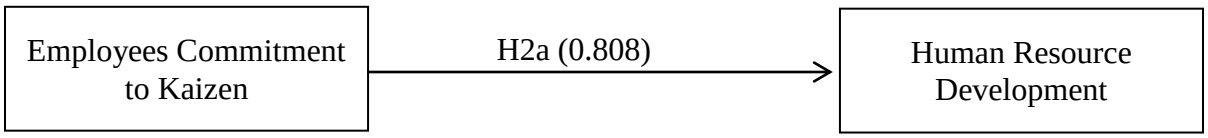


Figure 5.8a: Pearson correlation coefficient values showing strength of correlation between ECK and HRD

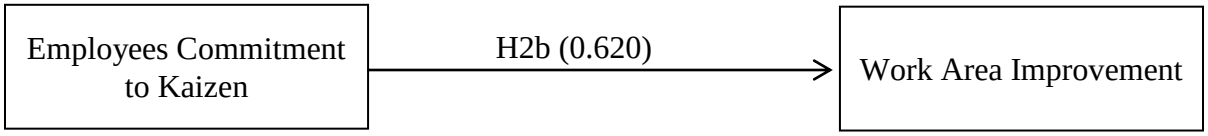


Figure 5.8b: Pearson correlation coefficient values showing strength of correlation between ECK and WAI

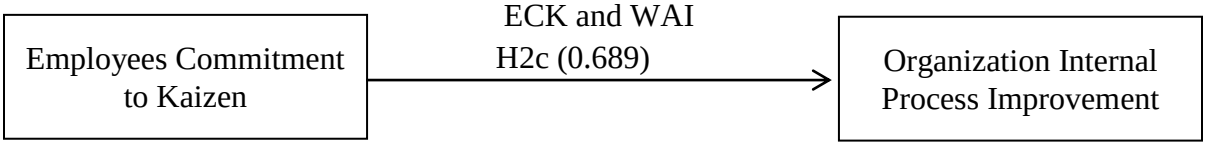


Figure 5.8c: Pearson correlation coefficient values showing strength of correlation between ECK and OIPI

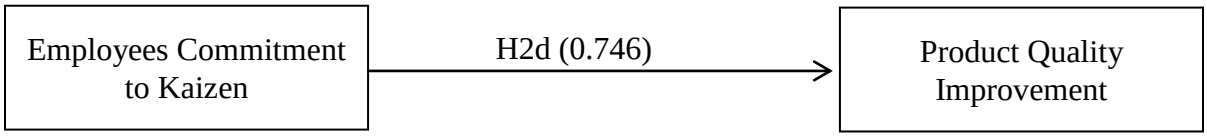


Figure 5.8d: Pearson correlation coefficient values showing strength of correlation between ECK and PQI

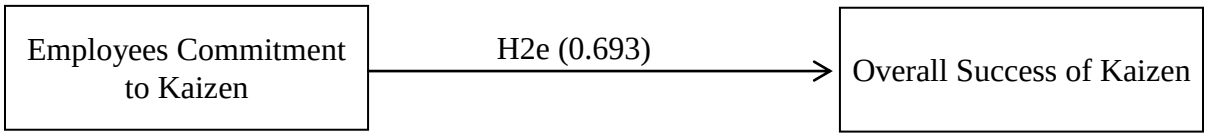


Figure 5.8e: Pearson correlation coefficient values showing strength of correlation between ECK and OSK

5.5.2.2 **Testing of Hypotheses H2f to H2j**

H0f to H0j: Process variable "action oriented Kaizen" has no significant association with outcome variables of Kaizen e.g. human resource development, work area improvement,

organization internal process improvement, product quality improvement and overall success of Kaizen.

Results of Pearson correlation coefficient test of process variable "action oriented Kaizen" given in Table 5.8, shows its strong association with outcome variables of effective implementation of Kaizen such as human resource development (0.692) and work area improvement (0.707), whereas it shows medium type association with organizational internal process improvement (0.681), product quality improvement (0.646) and overall success of Kaizen (0.589). The significant *p* values for all outcome variables of Kaizen were less than the critical value of 0.05, which show that the correlation between PV "action oriented Kaizen" and outcome variable were significant. Hence, null hypothesis is rejected whereas alternate hypotheses H2f to H2j are accepted. So the process variable "action oriented Kaizen" has a relatively stronger relationship with outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK. The schematic view of this relationship is shown in Figure 5.9 a-e.

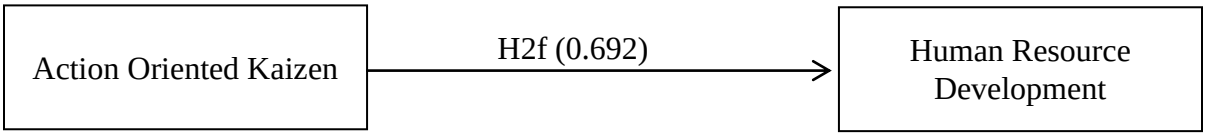


Figure 5.9a: Pearson Correlation Coefficient Values showing Strength of Correlation between AOK with HRD

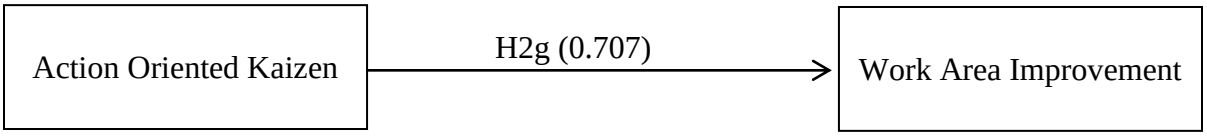


Figure 5.9b: Pearson Correlation Coefficient Values showing Strength of Correlation between AOK with WAI

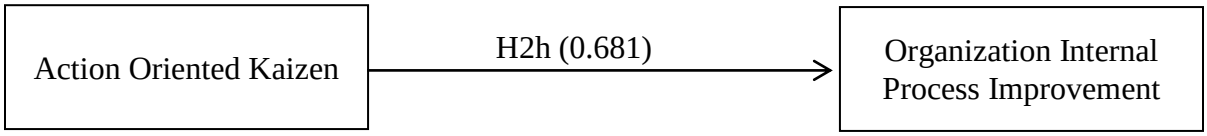


Figure 5.9c: Pearson Correlation Coefficient Values showing Strength of Correlation between AOK with OIPI

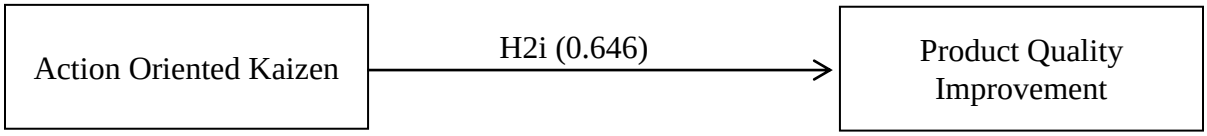


Figure 5.9d: Pearson Correlation Coefficient Values showing Strength of Correlation between AOK with PQI

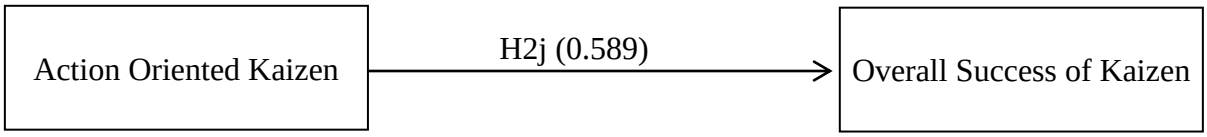


Figure 5.9e: Pearson Correlation Coefficient Values showing Strength of Correlation between AOK with OSK

5.5.2.3 **Testing of Hypotheses H2k to H2o**

H0k to H0o: Process variable "employee's knowledge about Kaizen tools and techniques" has no significant association with outcome variables of Kaizen e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

The results of Pearson correlation coefficient analysis of process variable "employee's knowledge about Kaizen tools and techniques" indicate its medium type correlation with outcome variable of effective implementation of Kaizen such as human resource development (0.551), product quality improvement (0.586), and moderate type relationship with organizational internal process improvement (0.364) and overall success of Kaizen (0.393). However, its correlation with work area improvement having correlation coefficient value (0.278) is low. Also the *p* value for all outcome variables are less than then critical value of (0.05). It means there is a significant correlation between EKTT and outcome variables of Kaizen. Hence, null hypothesis is rejected whereas alternate hypotheses H2k to H2o given above are accepted. The schematic view of this relationship is shown in Figure 5.10 a-e.

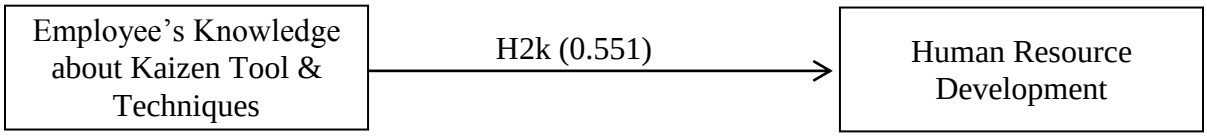


Figure 5.10a Pearson correlation coefficient values showing strength of correlation between EKTT with HRD

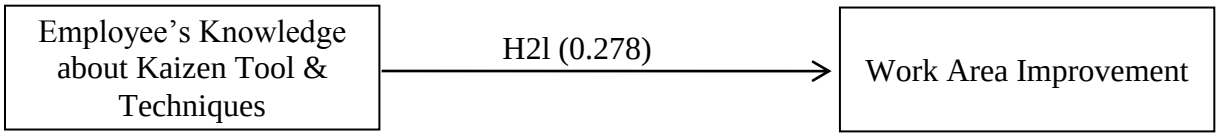


Figure 5.10b: Pearson correlation coefficient values showing strength of correlation between EKTT with WAI

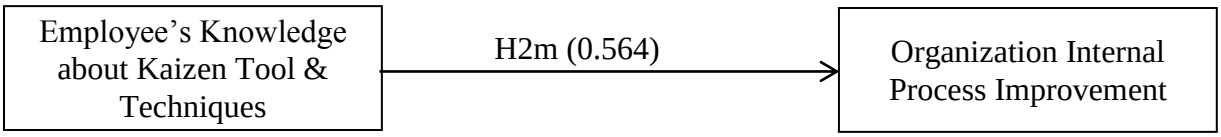


Figure 5.10c: Pearson correlation coefficient values showing strength of correlation between EKTT with OIPI

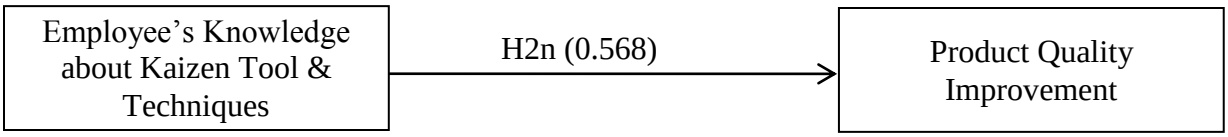


Figure 5.10d: Pearson correlation coefficient values showing strength of correlation between EKTT with PQI

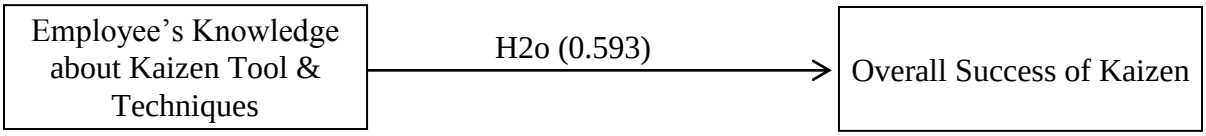


Figure 5.10e Pearson correlation coefficient values showing strength of correlation between EKTT with OSK

5.5.2.4 **Testing of Hypotheses H2p to H2t**

H0p to H0t: Process variable "standardization of organizational internal process" has no significant association with outcome variables of Kaizen e.g. human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

Pearson correlation coefficient values of process variable such as "standardization of organizational internal process" indicate its strong association with outcome variables of Kaizen such as human resource development (0.744) and organizational internal process improvement (0.704) and it has medium type association with product quality improvement (0.618), work area improvement (0.614) and overall success of Kaizen (0.677). The p value for all outcome variables are less than the critical value of (0.05). There is a significant correlation between SOIP and outcome variable of Kaizen. Hence, null hypothesis is rejected whereas alternate hypothesis H2p to H2t are accepted. The schematic view of this relationship is shown in Figure 5.11.

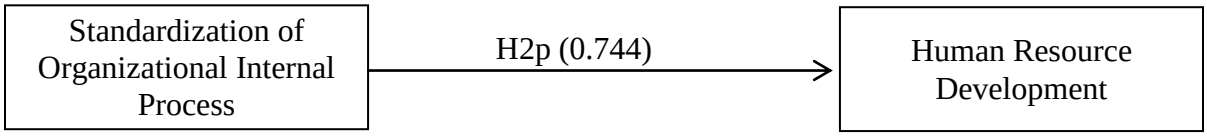


Figure 5.11a: Pearson correlation coefficient values showing strength of correlation between SOIP and HRD

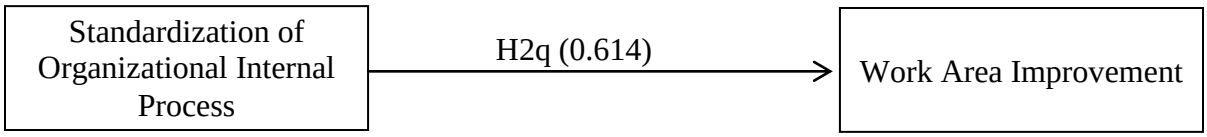


Figure 5.11b Pearson correlation coefficient values showing strength of correlation between SOIP and WAI

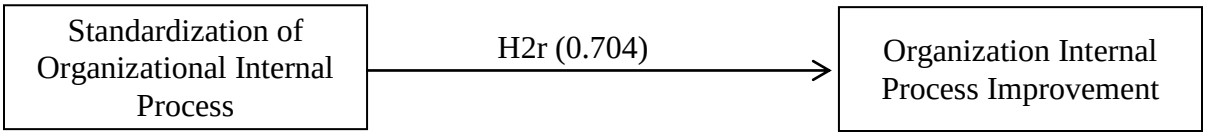


Figure 5.11c: Pearson correlation coefficient values showing strength of correlation between SOIP and OIPI

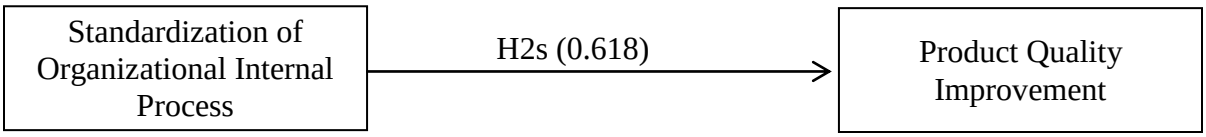


Figure 5.11d: Pearson correlation coefficient values showing strength of correlation between SOIP and PQI

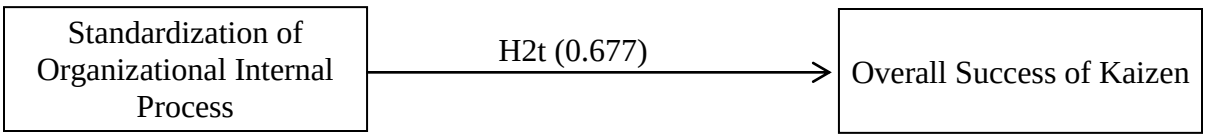


Figure 5.11e: Pearson correlation coefficient values showing strength of correlation between SOIP and OSK

Overall results of Pearson correlation coefficient values prove that all the process variables have association with outcome variables of effective implementation of Kaizen. Hence, the hypothesis H2a to H2t shown in Table 3.13 are accepted and null hypotheses are rejected.

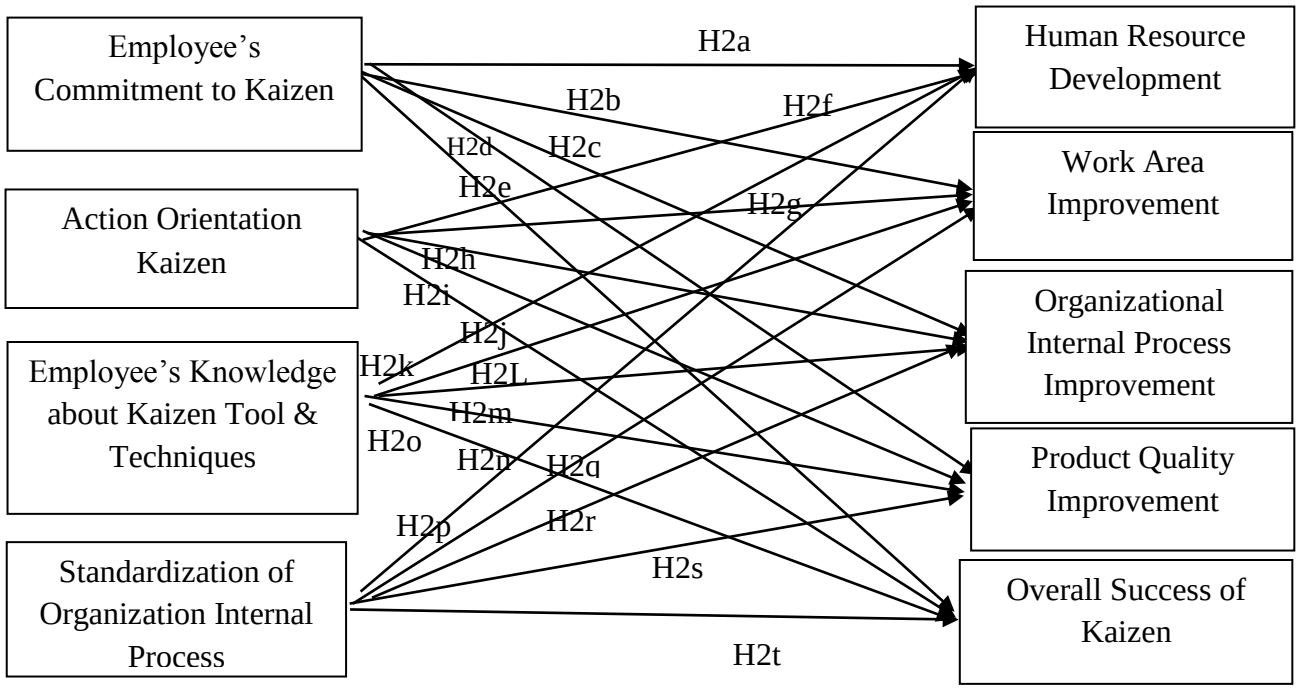


Figure 5.12 Relationship of PVs with Outcome Variable of Kaizen

5.6 **Multiple Regression Analyses for Testing of Hypotheses H3 to H5**

In this research, multiple regression analysis was used to predict the variation in outcome variable of Kaizen due to variation in more than one independent variables. The process of predicting or estimating dependent variable Y using multiple independent variables X1 to Xn is called multiple regressions analysis. Multiple linear regression models were built for each outcome variable of Kaizen which explains how much each independent variable was able to explain variation observed in each dependent variable of Kaizen. With the help of results of multiple regression analyses, it would be possible to test the theories / models precisely and to find out the contribution of each independent variable of Kaizen in each outcome variable in the form of human resource development, work area improvement, organizational internal process improvement, product quality improvement and overall success of Kaizen in an organization. Structural equation modeling was not performed in this research because this gives only the structural relationship between latent variables (Wiersema & Bantel, 1993).

Regression analyses method selected for this research was exploratory in a sense that it was not known before performing the regression analysis that which of the six independent variables were more strongly correlated with each of five outcome variables of Kaizen. To describe the observed relationship of each dependent variable, the set of independent variables

which are the most significant predictors, were selected and were reduced through backward selection method. In backward selection method, all the predictor variables are entered into the model at the same time. The weakest predictor variable is removed from the model and regression is then again recalculated. The predictor variable can be re-entered if its removal weakens the model, otherwise this predictor variable is deleted. The independent variables having lowest *F* value were eliminated at each step. This procedure was continued till the establishment of criterion for the *F* value no longer holds good and only strong or useful predictor variables remain in the regression model. Forward selection method and step wise method were not used in this research because they need a very large sample size. In step-wise method, IV having high (McAdam, Stevenson, & Armstrong, 2000) correlation value are gradually entered first and then variables having low correlation values are entered one by one in the model. Since order of entering variable in the model is not known before developing regression model hence, this method was not preferred. Enter method was used to check the mediation effects of process variable. Enter method was used to confirm that process variables mediate the relationship between predictors and criterion variables overall success of Kaizen in an organization.

Before carrying out multiple regression analysis, the basic assumptions for use of multiple regressions were confirmed. The predictor as well as criterion variables required to be predicted were measured as interval or ratio scale of 1 to 5, where 1 means respondent strongly disagree with the statement of the scale item and 5 means that respondent strongly agrees with the statement of scale item. Before building the regression model, six basic assumptions given below were referred to be confirmed (SPSS psychologist, 2005).

a. Linearity confirmation of the data (all mean values of dependent variables lie above and below the straight line. In other words the relationship between predictor and criteria variable is linear one or monotonic).
b. Normality confirmation of the data (the error term which is a random variable is normally distributed. It means variation in criterion variable is normally distributed for variation in each predictor variable).
c. Homoscedasticity means that all errors have same variance or mean standard deviation for each sub population remains constant.

d. Confirmation for rejection of outliers.

e. Fulfillment of minimum requirement of sample size for backward selection method of regressions analysis.

f. Checking of multicolinearity effect and minimizing it. Confirmation of absence of strong correlation i.e. $r \geq 0.9$ among independent variables.

To ensure the validity of the results, these six basic assumptions were confirmed before performing the multiple regression analysis. These assumptions were confirmed through statistical analysis of data. The values of Pearson correlation coefficient, variation inflation factor, histograms of residual, scatter plot of residual and normal P-P plot of the residual were determined to confirm these assumptions. Regression model was built for each dependent variable of social system outcome of Kaizen such as human resource development, work area improvement, organizational internal process improvement and technical system outcome of Kaizen such as product quality improvement and overall success of Kaizen in an organization separately. Backward selection method was used instead of step wise or forward method to build multiple regression models for this research. There are fewer chances to exclude important variables in backward selection method than forward or step-wise procedure (A. P. Field, 2009).

The general equation for building multiple regression models as given by (J. Li, 2011) was used in this research and shown in equation 5.3.

$$\ddot{Y} = \beta_0 + b1X1 \quad + \ b2x2 + b3X3 \pm \ldots bnXn \tag{5.3}$$

Where *βo* is constant known as Y intercept and b is the partial regression weight or beta coefficient value for a given independent variable X known as the slope of the line which measures the unique contribution of X to the overall prediction of dependent variable Y. The value of unknown beta coefficient were determined by ordinary least square method which minimized the sum of square of residual to estimate the slope and intercept for a regression model. The prediction through multiple regressions analysis will be more accurate as the correlation between predictor variables X and criterion variable Y become stronger, mean as the value of "r" approaches to 1, the accuracy of prediction power of the model will be more. The coefficient of determination is the value of variation in criterion variable Y which is explained by

variation in predictor variable X. The detail confirmation of assumptions before building a linear regression models are given as under:

5.6.1 **Linearity Confirmation**

Linearity confirmation of data means that there must be a linear relationship between predictors and criterion variables. All mean values of dependent and independent variables lay on above and below the straight line. Linear relationship means that it follows straight line instead of curve or any other pattern. Linearity was confirmed by drawing Scatter Plot of scores of each independent and dependent variable. To check the appropriateness of linear multiple regression model, Scatter plot were used to graph each independent and dependent variable pair. The results are given in Annexure L of this research report. The Scatter plot shows that there is a roughly straight line instead of curve or any other pattern which confirms the linearity of data.

5.6.2 **Normality Test**

To perform the regression analysis through Ordinary Least Square (OLS) method, it is necessary that errors must be normally distributed. This assumption was checked by plotting histograms and Normal P-P plot of residuals regression standardized of dependent variables. Normality confirmation of data means that the error term which is random variable, is normally distributed. Residual, which is the difference is between measured and the predicted value of criterion variable, should be normally distributed around the predicted scores of dependent variable. The normality test of the data aggregated at organization level was carried out by plotting histograms of regression standardized residual. The histograms of all dependent variables calculated through multiple linear regression analysis are shown in Annexure K. The histogram shows that the data related to all criterion variables is approximately bivariate, normally distributed and normality assumption for regression analyses was not violated.

5.6.3 **Homoscedasticity Test**

Homoscedasticity (all errors have same variance) means that a variance of the residuals about predicted criterion variable score must be same for all predicted scores. In other words, we can say that variation in scores of dependent variable X should be same for all values of independent variable Y. Homoscedasticity is confirmed by drawing scatter plot of residual. The scatter plot indicates fairly cigar shape along its length. If the results of scatter plots show that

there is no clear relationship between residual and predicted values, it means the data is consistent with the assumption of homoscedasticity. The homoscedasticity means that errors show constant variance as indicated by P-P plot of studentized residual against predicted values. If the studentized residual has mean value 0 and variance equal to ±1, then computed residual from the model is valid. If the model is correct and error is normally distributed, then 95% of the residual value will fall within ±2. The assumption of homoscedasticity would be violated if the residuals shown in Annexure M are progressively getting large. Since the value of residual is not large enough, hence the assumption of constant variance for residual or homoscedasticity seems to be reasonable for all independent variables of Kaizen.

5.6.4 **Checking of Outlier**

Checking for outlier is a part of initial data screening. Very high or low scores indicate presence of outlier which affects the results of multiple regression analysis. Therefore, it is necessary that the outlier should be eliminated from the data set or alternately score for the variable which is high but not too different from the remaining values should be added. Outliers from the data were examined through finding Mahalanobis distance values. As per Pallant (2005), for normal range of data having no outlier, value of Mahalanobis distance ranges from 0.608 to 32.4. Any values beyond this range indicate the presence of outliers in the given data. As per Tabachnick and Fidell (2001) the critical value of Mahalanobis distance depend on number of independent variables. The range of critical values for identification of outlier related to different number of independent variables is shown in Table 5.9. For the selection of critical value to identify the outlier in the data, the number of independent variables must be known.

Table 5.9: Critical Values of Mahalanobis Distance for Evaluating Outliers in Data

Number of IVs	Critical Value of Mahalanobis	Number of IVs	Critical Value of Mahalanobis
2	13.82	5	20.52
3	16.27	6	22.46
4	18.47	7	24.32

The critical value for chi-square can also be obtained from Sekaran, (2003). The Mahalanobis distance values were checked for all dependent variables one by one from residual statistics of regression analyses. As per Coakes & Steed (2003), the outliers will only be

excluded from the data if the number of outlier is a big one. The Mahalanobis distance values for each dependent variable with six independent variables are shown in Table 5.10.

Table 5.10: Residuals Statistics Showing Values of Mahalanobis Distances

Dependent Variables (DV)	No of Independent Variables (IV)	Mahalanobis Distance Values				
		Min	**Max**	**Mean**	**St Dev**	**Critical value**
HRD	6	1.516	29.237	6.000	4.850	22.46
WAI	6	.052	11.896	2.944	2.780	22.46
OIPI	6	.278	21.701	3.926	3.658	22.46
PQI	6	.156	15.593	2.944	2.897	22.46
OSK	6	.406	25.410	3.926	4.133	22.46

The Table shows that the maximum value of Mahalanobis distance ranges from 11.896 to 29.237 and the average value ranges from 2.78 to 6.00 which is less than the upper critical value of 22.46 for the regression model having 6 independent variables. However, the maximum value for dependent variable human resource development and overall success of Kaizen are greater than critical value indicating that there are few outliers in data of these two dependent variables. These outliers were not excluded from the observed data because they were not in a large quantity Coakes & Steed (2003).

5.6.5 **Sample Size**

To generalize and to increase the scientific value of the result of multiple regression analysis, sample size must be large enough. As per Steven (1996 p. 72), to achieve reliable multiple regression model for social science research, there must be at least 15 observations against each predictor variable. Tabachnick and Fidell (2001), give a formula for sample size to get the reliable results from multiple regression analyses which is given as

$$N > 50 + 8M \quad \text{where M= number of predictor variables.}$$

It means for six predictor variables, number of observations must be more than 98. As per A. Field (2009), the minimum number of observations should be more than ten times the number of variables being used for the development of regression model. In this research, the number of respondents were 173 from 54 different organizations against six predictor variables. Thus sample size is enough to obtain a reliable result from multiple regression analyses.

5.6.6 **Multicolinearity Test**

Multicolinearity can be defined as high degree of correlation among independent variables. When using the Ordinary Least Square method, multicolinearity can be interpreted as the extent to which the variance of the regression parameter for k_{ith} independent variable is inflated when other variable "P" (where P represents the total number of parameters being estimated in the model) is included in the regression model. The presence of multicolinearity was examined by two methods:-

a. Measuring Variance Inflation Factor (VIF) and Tolerance Value.

b. Calculating Pearson correlation coefficient among predictor variables.

As per Li and Doolen (2013), a commonly accepted rule of thumb for multicolinearity is that an individual VIF value ≥10 can create problem of multicolinearity in building linear regression model. As per Neter et al. (1996), the value of VIF greater than 10 can create problems of instability of the regression model and give inflated standard errors estimates for regression analyses results (SSP survival manual P-150). The variance of regression coefficient increases along the increase in VIF, given by (Li 2011) through equation 5.4.

$$\mathrm{VIF} = \frac{1}{1-r_j^2} \tag{5.4}$$

Where, VIF is variance inflation factor and r_j^2 is squared multiple correlation of that variable with other independent variable.

To determine the level of existence of multicolinearity in aggregated data related to independent and process variables, values of VIF for each variable are calculated and results are shown in Table 5.11. The result shows that none of the independent variable has value of VIF greater than 3. The maximum observed value of VIF is 2.48 for independent variable top management commitment to Kaizen which is also less than 3 value. Average value of VIF was found to be 1.18. Tolerance is the value which explains how much of the variability of the specified independent variable is not explained by other independent variable in the model and is calculated by using formula as $(1-R^2)$, where R is correlation between observed and predicted values of criterion variable.

According to Tabachnick and Fidell (2001 p. 84) multicolinearity of one variable will be high with other independent variables if the values of tolerance is equal to or less than 0.1. As per (SPSS Survival Manual P-150), the threshold value of tolerance creating problem of multicolinearity is ≤ 0.1. In Table 5.11 all values of tolerance appear to be greater than 0.1. Maximum observed value of tolerance is 0.678 and average observed value of tolerance is 0.57. The values of VIF and tolerance indicate that there is no issue of multicolinearity among independent variables (IV) and process variables (PV) as such.

Table 5.11: Values of VIF and Tolerance for Independent Variables and Process Variables

Independent Variables (IV)	**Colinearity Statistics Values**	
	Tolerance	**VIF**
Top management commitment	.404	2.478
Organizational Kaizen culture	.616	1.624
Personal initiative	.564	1.774
Rewards and recognition	.590	1.696
Training of workers	.678	1.475
Kaizen event and team design	.549	1.820
Average VIF values	**0.57**	**1.81**
Maximum VIF values	**0.678**	**2.478**
Process Variables (PV)		
Employees commitment to Kaizen	.334	2.992
Action orient Kaizen	.454	2.203
Employees knowledge about Kaizen tools and techniques	.685	1.459
Standardization organizational internal process	.583	1.715
Average VIF Values	**0.51**	**2.09**
Maximum VIF Values	**0.685**	**2.992**

*A Dependent Variable: Overall Success of Kaizen (OSK)

The multicolinearity was also examined for process variables by determining values of VIF and tolerance. Results are shown in Table 5.13. The results show that none of the process variable has value of VIF greater than 3. The maximum observed value of VIF is 2.99 for variable "employee's commitment to Kaizen" which is less than 3. Average value of VIF was found to be 2.09 (less than 3). All values of Tolerance were also found to be greater than 0.1. Maximum observed value of tolerance is 0.685 and average observed value of tolerance is 0.51. So the resultant value of VIF and Tolerance indicate that there is no severe issue of multicolinearity among process variables as well.

In order to assess the existence of multicolinearity among different independent variables and process variables, correlation coefficient value between each independent variable & process variables was also determined. The correlation coefficient values are shown in Table 5.12.

As per Tabachnick and Fidell (2001), p-84, two variables with bivariate correlation coefficient value of 0.7 and above can create a problem of multicolinearity and should be avoided for inclusion in the regression model. Although correlation coefficient values for independent variables as well as for process variables show a significant relationship between independent variables and also between process variables, none of the variable has strong correlation coefficient "r" value greater than 0.7; therefore, multicolinearity is not a significant problem for multiple regression analysis of the data.

Table 5.12: Showing Pearson Correlation coefficient Values of IVs and PVs

Independent Variables (IV)		**TMC**	**OKC**	**PI**	**RR**	**TOW**	**KETD**
TMC	Pearson Correlation	1					
	Sig. (2-tailed)	.000					
OKC	Pearson Correlation	.454**	1				
	Sig. (2-tailed)	.001					
PI	Pearson Correlation	.539**	.574**	1			
	Sig. (2-tailed)	.000	.000				
RR	Pearson Correlation	.569**	.258	.366**	1		
	Sig. (2-tailed)	.000	.059	.006			
TOW	Pearson Correlation	.475**	.189	.316*	.519**	1	
	Sig. (2-tailed)	.000	.171	.020	.000		
KETD	Pearson Correlation	.648**	.437**	.425**	.425**	.314*	1
	Sig. (2-tailed)	.000	.000	.001	.001	.010	
Process Variables (PV)		**ECK**	**AO**	**EKTT**	**SOIP**		
ECK	Pearson Correlation	1					
	Sig. (2-tailed)						
AO	Pearson Correlation	.613**	1				
	Sig. (2-tailed)	.000					
EKTT	Pearson Correlation	.521**	.250	1			
	Sig. (2-tailed)	.000	.068				
SOIP	Pearson Correlation	.622**	.537**	.392**	1		
	Sig. (2-tailed)	.000	.000	.003			

5.7 Testing of Hypotheses H3a - Building Regression Model for HRD

Ho3a: The criterion variable human resource development through Kaizen is not significantly affected by predictor variables of Kaizen i.e. top management commitment, organizational Kaizen culture, personal initiative of employees, rewards and recognition given to employees, training of workers and Kaizen event & team design.

Before testing the hypotheses through '*F*' statistics of building a regression model for dependent variable human resource development, certain assumptions related to ordinary least square method were confirmed which include following:-

a. The linearity confirmation of data (identify need for linear regression analysis).
b. Errors are normally distributed having mean value 0.
c. Errors display constant variance.
d. Errors are statistically independent.

First assumption for linearity of the data was confirmed through scatter plot and normal P-P Plot of observed cum probable values of data regarding dependent variable human resource development shown in Figure 5.13. The plot confirms the linearity of data for selection of multiple linear regression analysis method.

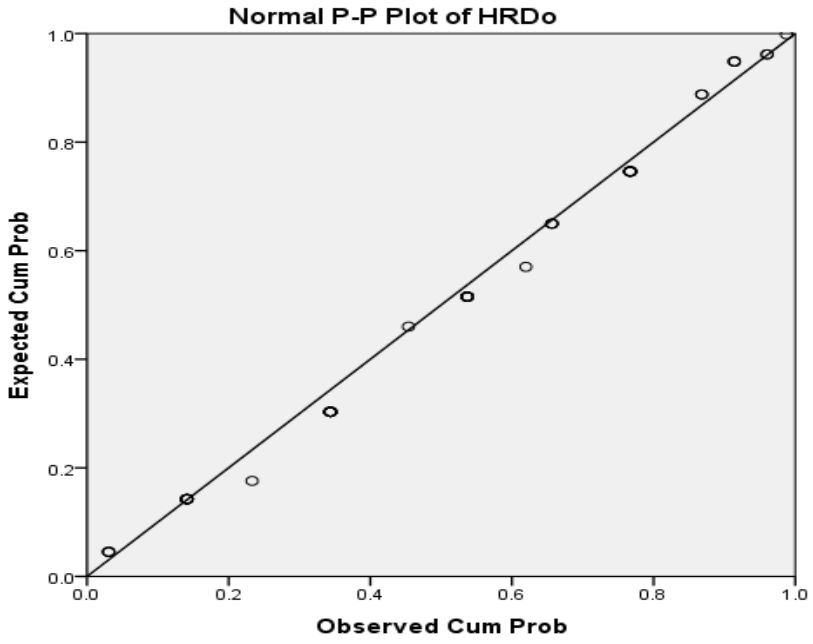


Figure 5.13: Normal P-P Plot between Observed and Expected Values of HRD

The result of P-P plot confirms first assumption reasonably. The graph shows that there is linear relationship between observed and expected values of DV human resource development and linearity assumption is not violated to build the linear regression model.

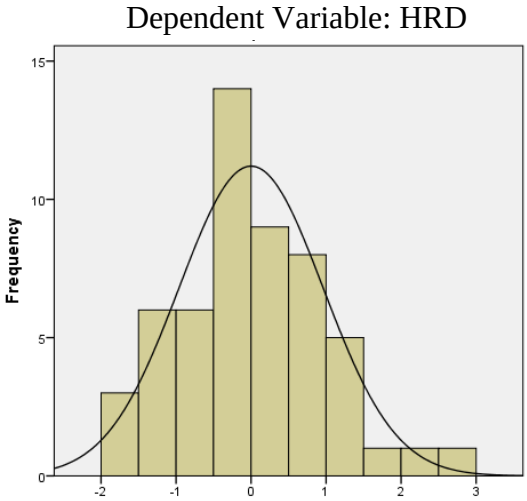


Figure 5.14: Regression Standardized Residual

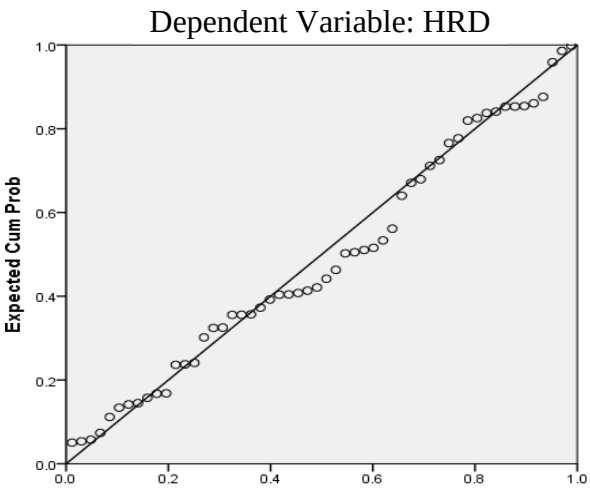


Figure 5.15: Normal P-P Plot of Regression Standardized Residual

The second assumption was confirmed through development of histogram and normal probability plot of regression standardized residuals of dependent variable human resource development as shown in Figure 5.14 and Figure 5.15. In this graph, plotted values roughly fall along the diagonal line. Since most of the points lie very close to the straight diagonal line and the histogram of regression standardized is normally distributed around the mean value, so second assumption that is normality confirmation for use multiple regression analysis (Tabachnick & Fidell, 2001 p. 154-157) is confirmed.

The third assumption for building a regression model for human resource development was confirmed by the graphical display of regression standardized residual against predicted values. To investigate possible variance in residual from the model, a graphical display known as studentized residual against predicted values for selected data related to criterion variable HRD is shown in Figure 5.16.

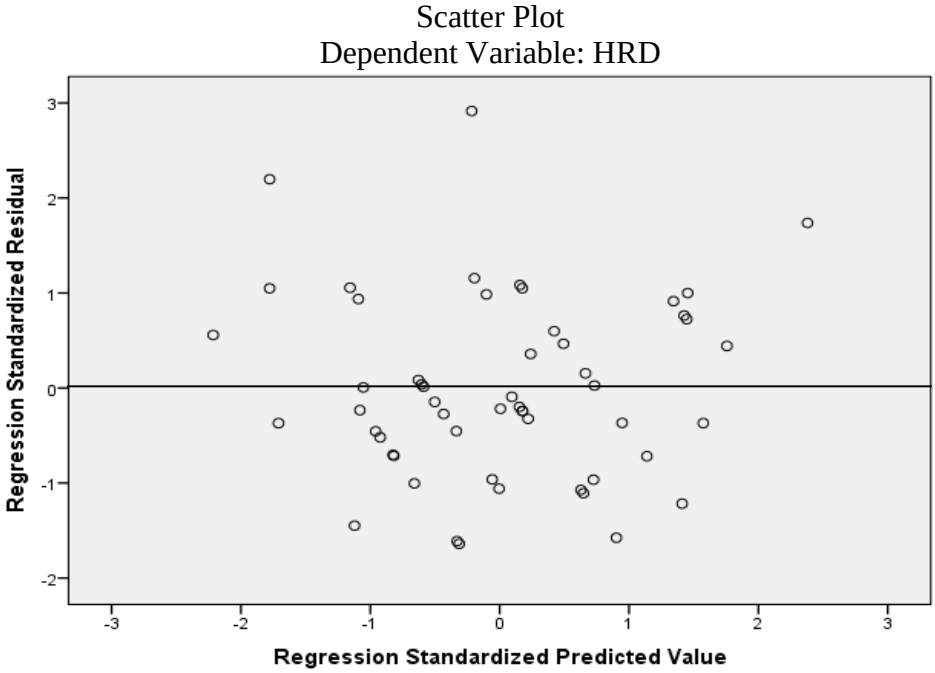


Figure 5.16: Scatter Plot of Regression Standardized Residual Values

In order to confirm the third assumption, the mean studentized residual value must be 0 and variance equal to 2. If errors are normally distributed, about 95% values of the residual will fall within ±2 value for correct model (only 1 in thousand should fall outside ±2). If the values of residual were getting progressively larger, then assumption of constant variance would be violated and there will be non-symmetric trend visible from graph of studentized residual value versus predicted value for human resource development as shown in Figure 5.16. The graph shows that no exact patron is formed for regression standardized residual and also more than 95 % values fall within ± 2. So the assumptions of constant variance for residuals are reasonable for development of a linear multiple regression model for dependent variable HRD.

The **fourth assumption** i.e. errors are statistically independent, was confirmed by ensuring that survey questionnaire was filled independently by the participants without any influence of the researcher or anyone else. It was ensured that the respondents have no communication among each other for the completion of survey questionnaire. The responses were collected from respondents of selected organization without any influence on respondents or their organizations. All four assumptions for the use of OLS method for building a regression model for HRD were confirmed.

The multiple regression model built for criterion variable human resource development is given in equation 5.7. The values of Pearson correlation coefficient given in Table 5.8 indicate that there is moderate to high correlation between predictors and criterion variable used in this model. The correlation between observed and predicted values of dependent variables is represented by R, whereas the value of R^2 shows the proportion of total variation in dependent variable (HRD) accounted for due to independent variables in the model.

To compensate for the optimistic biasness, an adjusted R^2 is used instead of R^2 because a sample estimate of R^2 tends to be an over estimate of the population parameters. Also adjusted R^2 reflects more closely that how well the model fits the population. Adjusted R^2 gives measures about the terms to be predicted by the model for future. Also the adjusted R^2 is the function of both variables sample size (N) and number of variables (p) in the model. The value of adjusted R^2 and R^2 is calculated (A. P. Field, 2009) through following formula:-

$$R^2_{\text{adjusted}} = R^2 - \frac{p(P-R^2)}{N-p^{-1}} \tag{5.5}$$

Where N is sample size and p is number of the variables being involved in the model.

$$R^2 = 1 + \frac{\text{residual sum of squares}}{\text{total sum of squares}} \tag{5.6}$$

The value of R^2 and adjusted R^2 for the regression model HRD with different independent variables are shown in the Table 5.13.

Table 5.13: Model Summary for HRD

Model	R	R Square	Adjusted R Square
1	.889	.790	.763
2	.888	.788	.766
3	.886	.785	.767

The values R^2 and adjusted R^2 for the model having six independent variables found 0.790 and 0.763, respectively. Similarly, the value of R^2 and adjusted R^2 for second regression model having five independent variables are 0.788 and 0.766 respectively. There is a drop of 0.002 in the value of R^2 whereas adjusted R^2 increases from 0.763 to 0.766. Similarly, third regression model indicates values of R^2 and adjusted R^2 as 0.785 and 0.767 respectively. There is a slight decrease in the value of R^2 and increase in value of adjusted R^2. The model consisting of

all six independent variables will account for 76.3% variation in HRD due to six independent variables whereas regression model having five independent variables less KETD will account for 76.6% variation in the outcome variable HRD. Third model which is significant, has four IVs and accounts for 76.7% variation in outcome variable "HRD".

To test the hypotheses, F statistics was used. The results of *F* statistics shown in Table 5.14 indicate that all there models are significant. Hence the null hypothesis is rejected. The values of slop or beta coefficient (β1 to β6) for all three models are shown in the Table 5.17.

Table 5.14: F- Statistic or ANOVA Values for HRD

Model		Sum of Squares	Degree of Freedom (df)	Mean Square	F	Significance
1	Regression	.873	6	.145	29.430	.000[b]
	Residual	.232	47	.005		
	Total	1.105	53			
2	Regression	.871	5	.174	35.684	.000[c]
	Residual	.234	48	.005		
	Total	1.105	53			
3	Regression	.867	4	.217	44.635	.000[d]
	Residual	.238	49	.005		
	Total	1.105	53			

b. Predictors: (Constant), KETD, TOW, OKC, RR, PI, TMCS
c. Predictors: (Constant), TOW, OKC, RR, PI, TMCS
d. Predictors: (Constant), TOW, OKC, RR, TMCS

To find out the relevant importance of different predictor variables involved in regression models or to select the best model *t*-statistic is used. The value of *t*-statistics for each independent variable can be calculated by dividing each coefficient by its standard error. Value can be calculated by using formula which involves the sum of squares of residuals from regression model having all independent variables and sum of square of residual from the model developed by eliminating non-significant independent variables.

The general rule says that all those independent variables having *t*-statistics values less than -2 or greater than +2 are useful for a given model. The results of *t*-statistics for outcome variable human resource development regression model given in Table 5.15 shows that there are only four significant independent variables, i.e. top management commitment, organization Kaizen culture, reward and recognition and training of workers which contribute in model 3. All

four independent variables have *t* values greater than +2. Therefore model 3 having four independent variables is the best model for prediction of dependent variable HRD.

Table 5.15: t-Statistics and β Coefficient Value for HRD

Model		Unstandardized Coefficients	Standardized Coefficients	t-Value	Significance
		B	B		
1	(Constant)	.146		.429	.670
	TMCS	.309	.381	3.619	.001
	OKC	.140	.165	1.932	.059
	PI	.069	.076	.851	.399
	RR	.201	.233	2.670	.010
	TOW	.191	.264	3.250	.002
	KETD	.058	.057	.631	.531
2	(Constant)	.223		.704	.485
	TMCS	.332	.410	4.376	.000
	OKC	.148	.174	2.092	.042
	PI	.070	.077	.871	.388
	RR	.205	.238	2.755	.008
	TOW	.190	.263	3.260	.002
3	(Constant)	.292		.958	.343
	TMCS	.350	.432	4.787	.000
	OKC	.175	.206	2.773	.008
	RR	.209	.242	2.823	.007
	TOW	.194	.269	3.348	.002

Using backward selection method the final regression model developed for criterion variable HRD is given as under: -

$$HRD = 0.292 + 0.432 * TMC + 0.206 * OKC + 0.242 * RR + 0.269 * TOW \quad (5.7)$$

The final model represent that

Adjusted R square = .767; $F_{4, 49} = 44.6$, $P < 0.0005$ (using backward selection method).

Significant variables are shown below.

Predictor Variable	**Beta**	**p**
Top management commitment	.432	< 0.0005
Organizational Kaizen culture	.206	< 0.0005
Rewards and recognition	.242	< 0.0005
Training of workers	.269	< 0.0005

The schematic view of standardized beta coefficient values of each predictor variable contributing in this model is shown in Figure 5.17.

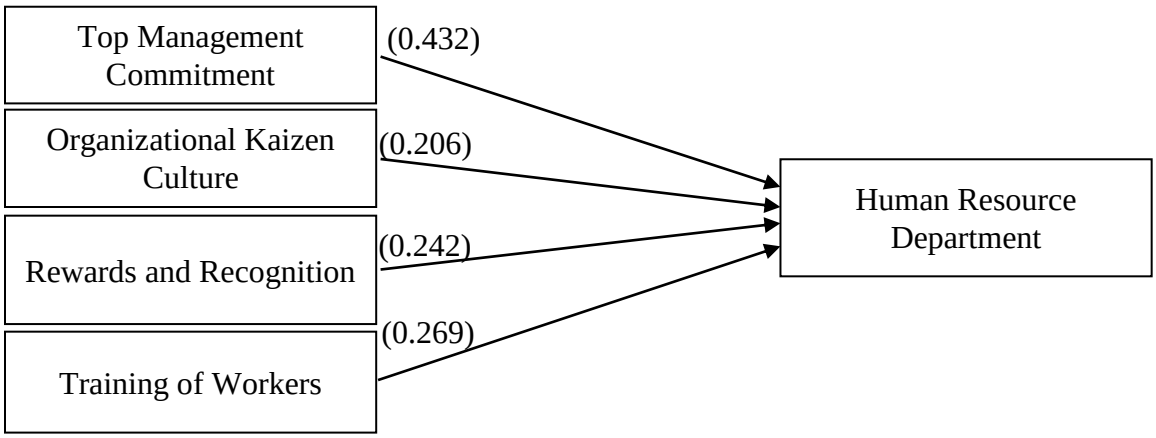


Figure 5.17: Multiple Regression Model Showing β Standardized Coefficient Value for HRD

Value of adjusted R^2 for the best selected model is 76.7% which suggests that 76.7% variation in HRD is accounted for in HRD due to four independent variables, i.e. TMC, OKC, RR and TOW. This model seems to be a very good model of multiple regression analysis. Among the four independent variables TMC having standardized beta coefficient value 0.432, has largest contributions. Other three independent variables such as organization Kaizen culture, rewards and recognition given to employees of the organization and training of workers have standardized beta coefficient values of 0.206, 0.242 and 0.269 respectively and they contribute significantly in the model. The result of regression model developed for HRD rejects the null hypothesis and partially accepts the alternate hypothesis. Alternate hypothesis says that dependent variable of Kaizen "human resource development" is significantly affected by independent variables of Kaizen.

The partial regression plots of four significant independent variables which contribute significantly in predicting variation in outcome variable HRD are shown in Figure 5.18.

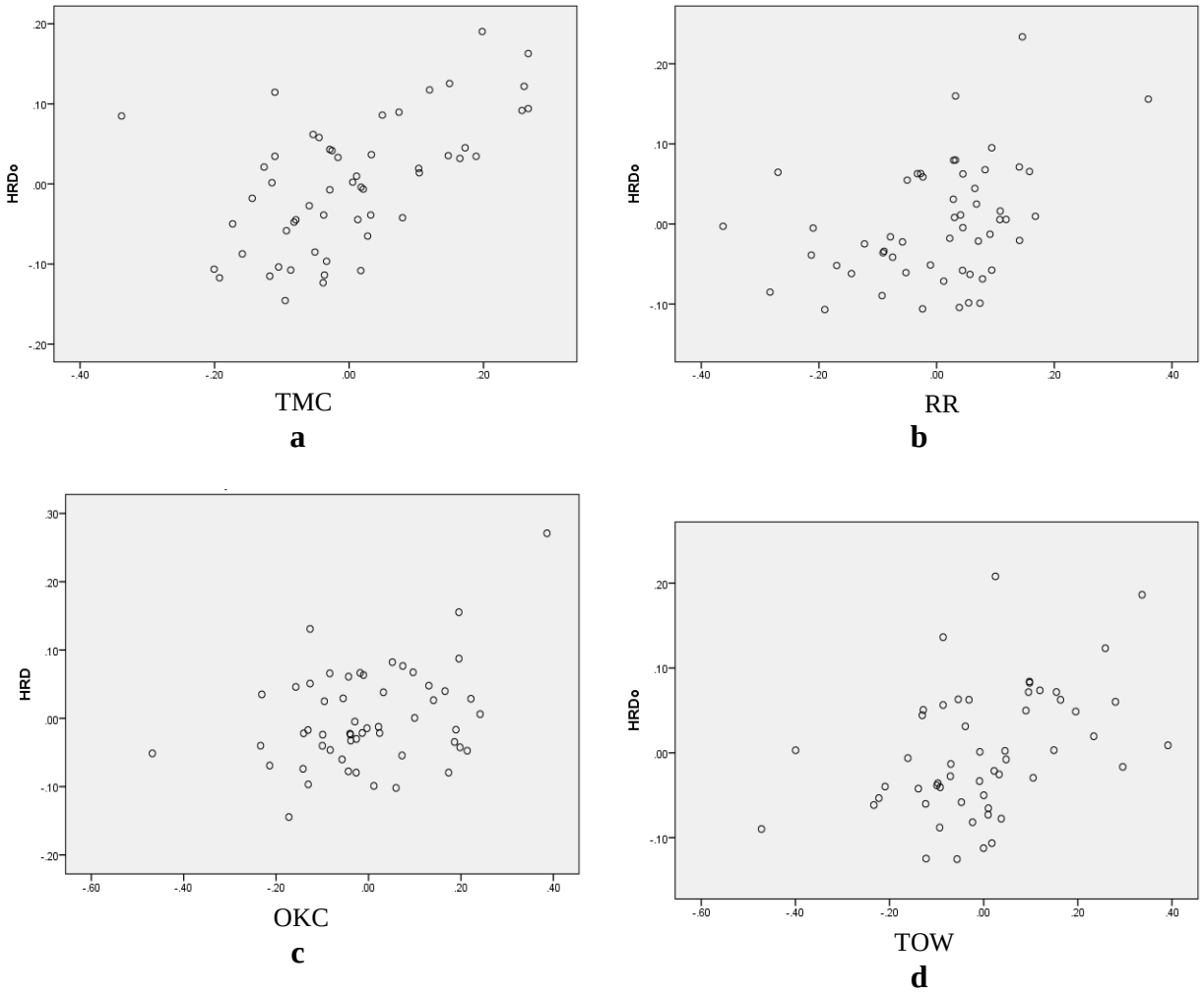


Figure 5.18 a-d: Partial Regression Plots of HRD

5.8 Testing of Hypothesis H3b - Building Regression Model for WAI

H0: Work area improvement in an organization through Kaizen is not affected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, reward and recognition, training of workers and Kaizen event & team design.

Hypothesis was tested through building multiple regression model for work area improvement using six independent variables. The assumptions for development of regression model were confirmed before proceeding further.

First assumption for multiple linear regression models was confirmed through scatter plot and normal P-P plot as shown in Figure 5.19. The plot confirms that data is linearly distributed, hence, first assumption is confirmed for linear regression model development.

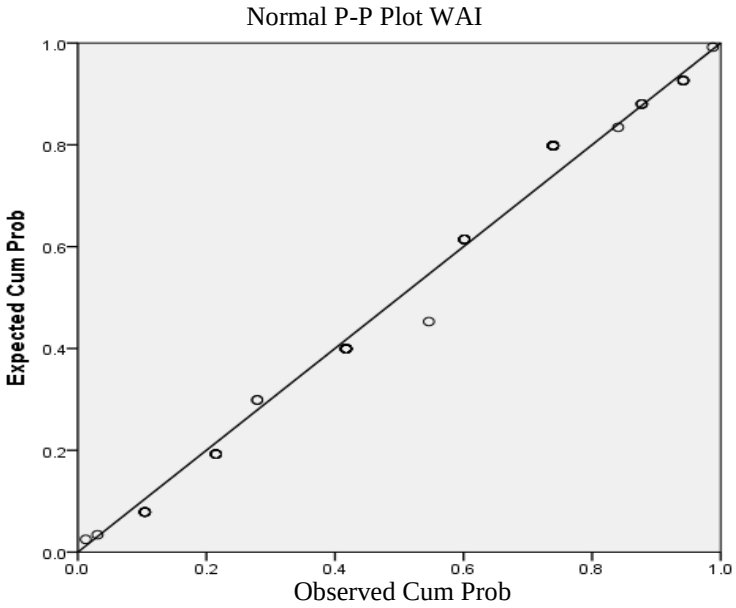


Figure 5.19: Normal P-P Plot between Observed & Expected Values of WAI

The **second assumption**, i.e. errors normally distributed around dependent variable work area improvement was confirmed through plotting of histogram and normal p-p plot of regression standardized residual shown in Figure 5.20.

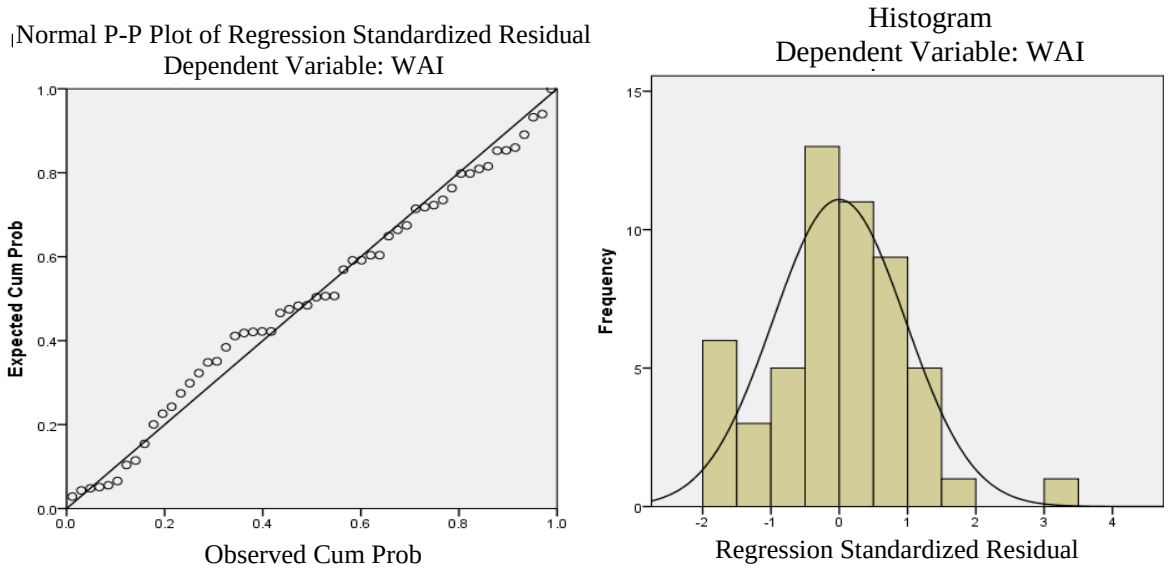


Figure 5.20: Histogram and Normal P-P Plot of Regression Standardized Residual for WAI

The **third assumption** that "the error exhibit constant variance" was confirmed by drawing scatter plot of studentized residual versus predicted values for dependent variable "work area improvement" shown in Figure 5.21. The plot confirms that 95% of the residual error falls within ±2 value which shows that error is not largely distributed enough. Furthermore, there is no specific pattern shown by the graph. Hence, third assumption for leaner regression model is confirmed.

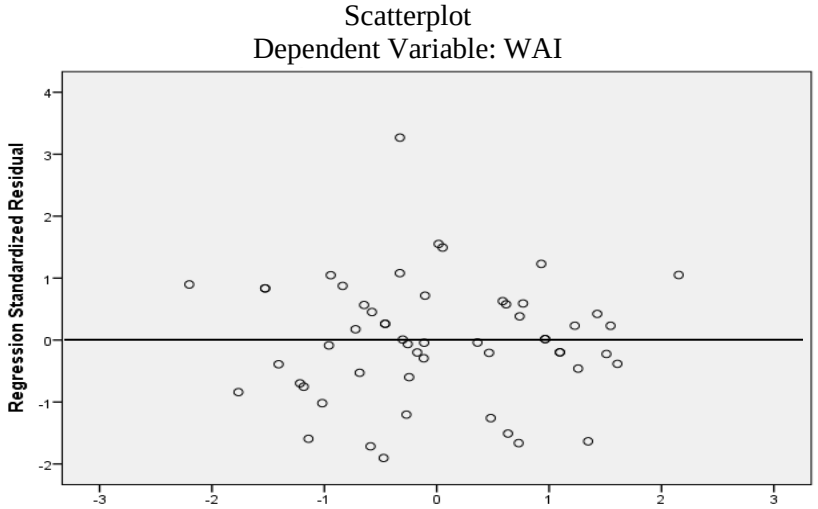


Figure 5.21: Scatter plot of Regression Standardized Residual Values for WAI

The **fourth assumption** was confirmed by ensuring that the respondents have no communication among themselves about survey response as well as the author has no influence on participants of the survey. Hence the fourth assumption that "errors are statistically independent is confirmed". After confirmation of all four assumptions, the regression model for dependent variable "work area improvement" was developed through multiple regression analysis using SPSS software. Model summary is shown in Table 5.16.

Table 5.16: Model Summary for WAI

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	0.862	0.744	0.711	
2	0.862	0.742	0.716	
3	0.861	0.741	0.720	
4	0.858	0.736	0.720	1.548

The results show that there were four possible models. Model summary indicates the value of R^2 for model one, two, three and four as 0.0744, 0.742, 0.741 and 0.736, respectively.

Similarly, the values of adjusted R^2 are 0.711, 0.716, 0.720 and 0.720 for model one, two, three and four, respectively.

The *F* statistics shown in ANOVA Table 5.17 confirm that all four models have *F* value >10, which suggests that all four models are significant. Hence, the null hypothesis is rejected and alternate hypothesis is partially accepted.

Table 5.17: F Statistics or ANOVA Values for WAI

ANOVA						
Model		**Sum of Squares**	**Degree of Freedom (df)**	**Mean Square**	**F**	**Significance**
1	Regression	0.849	6	0.141	22.721	0.000[b]
	Residual	0.293	47	0.006		
2	Regression	0.847	5	0.169	27.669	0.000[c]
	Residual	0.294	48	0.006		
3	Regression	0.845	4	0.211	34.997	0.000[d]
	Residual	0.296	49	0.006		
4	Regression	0.839	3	0.280	46.385	0.000[e]
	Residual	0.302	50	0.006		

b. Predictors: (Constant), KETD, TOW, OKC, RR, PI, TMC
c. Predictors: (Constant), TOW, OKC, RR, PI, TMCS
d. Predictors: (Constant), TOW, OKC, RR, PI
e. Predictors: (Constant), TOW, OKC, RR

The value of adjusted R^2 for model three and four are same; however, the '*t*-statistics' given in Table 5.18 indicate that model four in which all three independent variables have *t* values greater than +2 and significantly contributing in explaining variation in outcome variable, work area improvement is best available model. The final model having adjusted R^2 value 0.72 can account for 72% variation in outcome variable, work area improvement contributed by three independent variables, e.g. organization Kaizen culture, rewards and recognition given to participant of Kaizen and training of workers of the organization.

Table 5.18: *t*-Statistics and β Coefficient Values for WAI

Model		**Un standardized Coefficients**	**Standardized Coefficients**	**t-Value**	**Significance**
		B	β		
1	(Constant)	.276		.723	.473
	TMCS	.068	.082	.708	.483
	OKC	.174	.201	2.140	.038
	PI	.072	.078	.793	.432

	RR	.250	.284	2.955	.005
	TOW	.385	.525	5.857	.000
	KETD	-.049	-.047	-.472	.639
2	(Constant)	.212		.599	.552
	TMCS	.048	.058	.561	.577
	OKC	.167	.193	2.107	.040
	PI	.071	.077	.789	.434
	RR	.246	.280	2.949	.005
	TOW	.386	.526	5.914	.000
3	(Constant)	.209		.594	.555
	OKC	.176	.204	2.296	.026
	PI	.084	.091	.978	.333
	RR	.263	.299	3.400	.001
	TOW	.394	.537	6.231	.000
4	(Constant)	.298		.876	.385
	OKC	.216	.251	3.324	.002
	RR	.276	.315	3.630	.001
	TOW	.403	.549	6.445	.000

The final significant regression model for work area improvement using backward selection method in which only three independent variables were significant explaining 72% variation in criterion variable is given in equation 5.8.

$$WAI = 0.298 + 0.251 * OKC + 0.315 * RR + 0.549 * TOW \quad (5.8)$$

The final model represent that

Adjusted R square = .72; $F_{3, 50} = 46.38$, $P < 0.0005$ (using backward selection method).

Significant variables are shown below.

Predictor Variable	**Beta**	**p**
Organizational Kaizen culture	.251	< 0.0005
Rewards and recognition	.315	< 0.0005
Training of workers	.549	< 0.0005

The largest contribution in the model is that of variable “training of workers” having standardized beta coefficient value 0.549, whereas contribution of other two significant independent variables is shown in Figure 5.22.

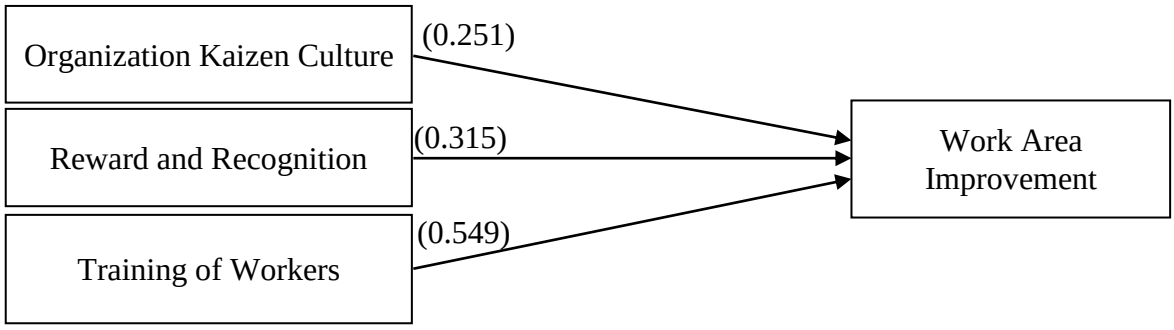
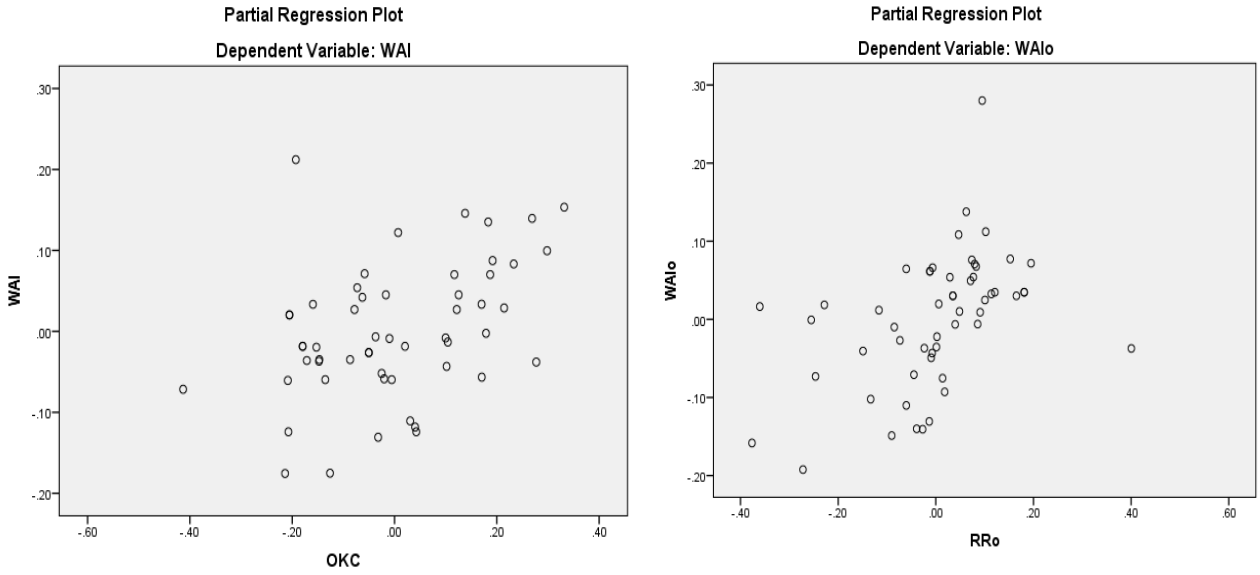


Figure 5.22: Multiple Regression Model Showing β Standardized Coefficient Values for WAI

The partial regression plot of all significant predictor variables for dependent variable work area improvement are shown in Figure 5.23.



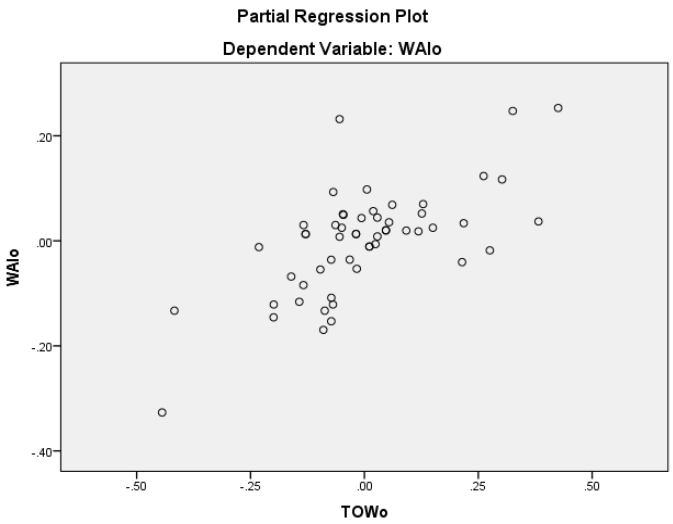


Figure 5.23: Partial Regression Plot for Dependent Variable WAI

5.9 Testing of Hypothesis H3c - Building Regression Model for PQI

H0: The null hypothesis says that product quality improvement through Kaizen is not significantly affected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, training of workers and Kaizen event and team design.

Whereas the alternate hypothesis H3c says that product quality improvement through Kaizen in an organization is affected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, rewards and recognition, training of workers and Kaizen event & team design.

In order to test the hypothesis, multiple regression model for dependent variable product quality improvement through Kaizen was developed. To build a multiple regression model for dependent variable product quality improvement, a similar set of assumptions were made as discussed above in section 5.7.

First assumption for linearity of the data was confirmed through scatter plot and normal P-P Plot of observed cum probable values and expected-cum-probable values of data regarding dependent variable product quality improvement as shown in Figure 5.24. The plot confirms the linearity of data for selection of linear regression analysis method.

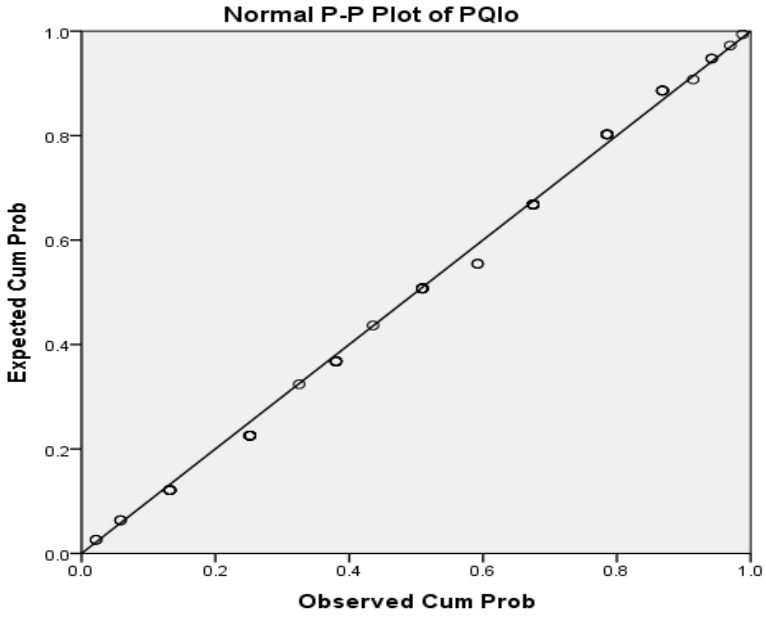


Figure 5.24: Normal P-P Plot between Observed & Expected Values of Data Collected against PQI

Similarly, to confirm that errors are normally distributed, normal P-P plot of regression standardized residual and histogram for dependent variables product quality improvement were plotted through multiple regression analysis. Results are shown in Figure 5.25. The graph confirms that regression standardized residual for PQI is normally distributed. Hence, **assumption 2** is confirmed.

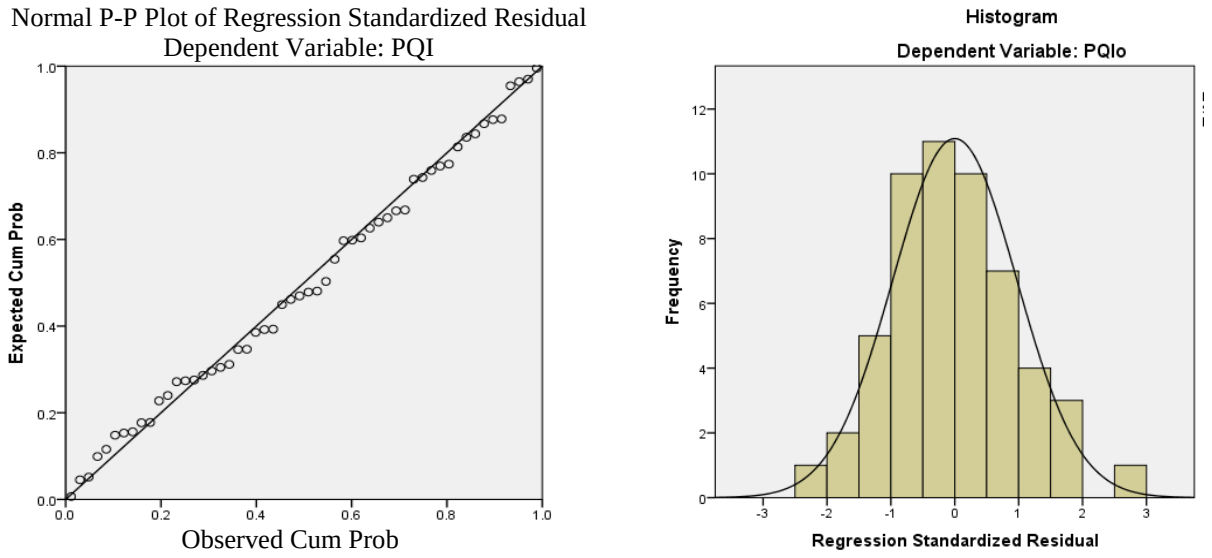


Figure 5.25: Histogram & Normal P-P P plot for PQI

Third assumption that errors display constant variance was confirmed by plotting studentized residual plot versus predicted values for dependent variable of Kaizen PQI as shown in Figure 5.26. The figure shows that residual values are not dispersed large enough (95% residual error values falls within ±2). There is no exact pattern form as shown in the graph.

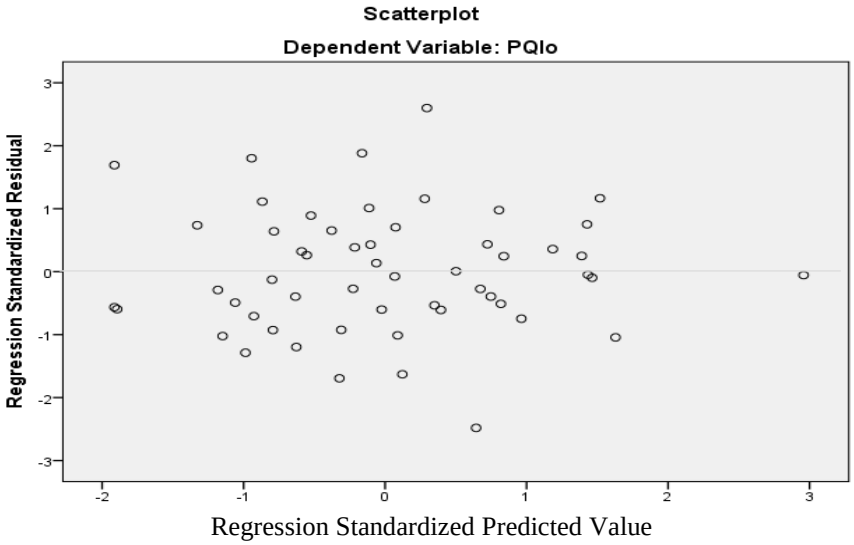


Figure 5.26: Scatter plot of Regression Standardized Residual Values of PQI

For the confirmation of fourth assumption, the perceptions of the respondents were measured independently. It was ensured during the survey of the organization that none of the respondents knew about perceptions of other respondents measured through survey; neither the researcher has any kind of influence on the respondents regarding response on the survey question. After meeting four assumptions, the multiple regression analysis for development of regression model for outcome variable "product quality improvement" was performed. All possible models developed as result of multiple regression analysis using SPSS software are shown in Table 5.19.

Table 5.19: Model Summary for PQI

Model	R	R Square	Adjusted R Square
1	0.859	0.739	0.705
2	0.859	0.739	0.711
3	0.859	0.739	0.717
4	0.859	0.739	0.723

Four possible models appear from the result of multiple regression analyses. The *F* statistics from the ANOVA indicate that all four models are significant as indicated by critical value of F >10, thus rejecting the null hypothesis. The model summary shown in Table 5.20 indicates that the value of R^2 0.739 is same for all four types of models. However, value of adjusted R^2 increases from 0.705 to 0.723 for model four.

Table 5.20: F Statistics or ANOVA Values for PQI

Model		Sum of Squares	Degree of Freedom (df)	Mean Square	F	Significance
1	Regression	1.110	6	.185	22.147	.000[b]
	Residual	.392	47	.008		
	Total	1.502	53			
2	Regression	1.110	5	.222	27.141	.000[c]
	Residual	.392	48	.008		
	Total	1.502	53			
3	Regression	1.110	4	.277	34.619	.000[d]
	Residual	.393	49	.008		
	Total	1.502	53			
4	Regression	1.109	3	.370	47.072	.000[e]
	Residual	.393	50	.008		
	Total	1.502	53			

b. Predictors: (Constant), KETD, TOW, OKC, RR, PI, TMCS
c. Predictors: (Constant), KETD, TOW, OKC, PI, TMCS
d. Predictors: (Constant), TOW, OKC, PI, TMCS
e. Predictors: (Constant), TOW, OKC, TMCS

From the *t*-statistic shown in Table 5.21, it is clear that model 4 is best one. The values of *t*-statistic for this model indicate that all three independent variables have value of t > 2. Hence, model 4 developed as a result of multiple regression analysis is best one. In this model 72.3% variations in criterion variable "product quality improvement" will be accounted for this model.

Table 5.21: *t*-Statistics and β Coefficient for PQI

Model		Un standardized Coefficients	Standardized Coefficients	t-Value	Significance
		B	B		
1	(Constant)	-.332		-.749	.457
	TMC	.393	.416	3.549	.001
	OKC	.327	.330	3.473	.001

	PI	.015	.014	.140	.889
	RR	.002	.002	.024	.981
	TOW	.293	.348	3.841	.000
	KETD	.014	.012	.116	.908
2	(Constant)	-.329		-.778	.441
	TMC	.394	.417	3.744	.000
	OKC	.327	.330	3.511	.001
	PI	.015	.014	.143	.887
	TOW	.293	.349	4.132	.000
	KETD	.014	.012	.120	.905
3	(Constant)	-.309		-.803	.426
	TMC	.400	.424	4.407	.000
	OKC	.329	.332	3.626	.001
	PI	.015	.014	.148	.883
	TOW	.294	.349	4.176	.000
4	(Constant)	-.293		-.801	.427
	TMC	.404	.428	4.726	.000
	OKC	.335	.338	4.161	.000
	TOW	.295	.350	4.258	.000

The result of F statistic from ANOVA reject the null hypotheses and partially accept alternate hypotheses. On the basis of result of regression model hypothesis is partially accepted. The final model consists of three independent variables top management commitment, organization Kaizen culture and training of workers as shown by equation 5.9.

$$PQI = -.293 + 0.428 * TMC + 0.338 * OKC + 0.350 * TOW \quad (5.9)$$

The final model represent that

Adjusted R square = .723; $F_{3, 50} = 47.07$, $P < 0.0005$ (using backward selection method).

Significant variables are shown below.

Predictor Variable	**Beta**	**p**
Top management commitment	.428	< 0.0005
Organizational Kaizen culture	.338	< 0.0005
Training of workers	.350	< 0.0005

Schematically the values of standardized beta coefficient for significant independent variables are shown in Figure 5.27.

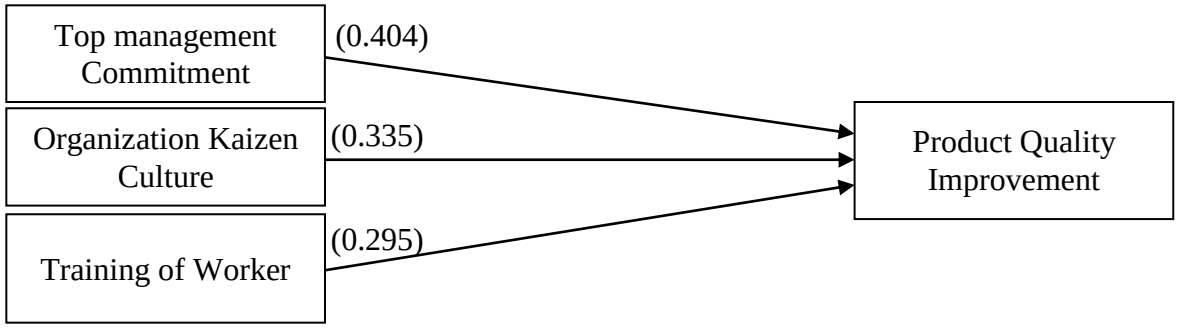
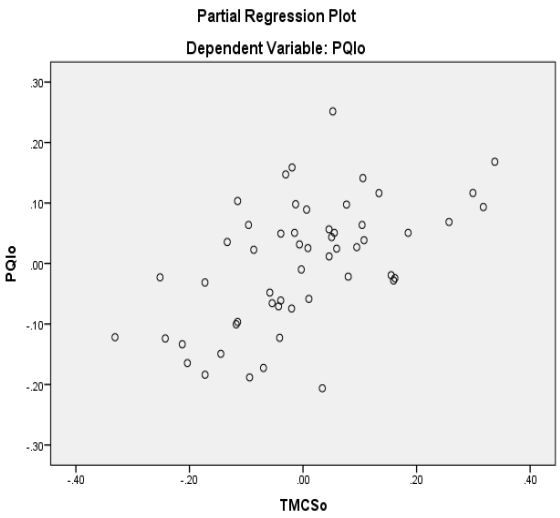
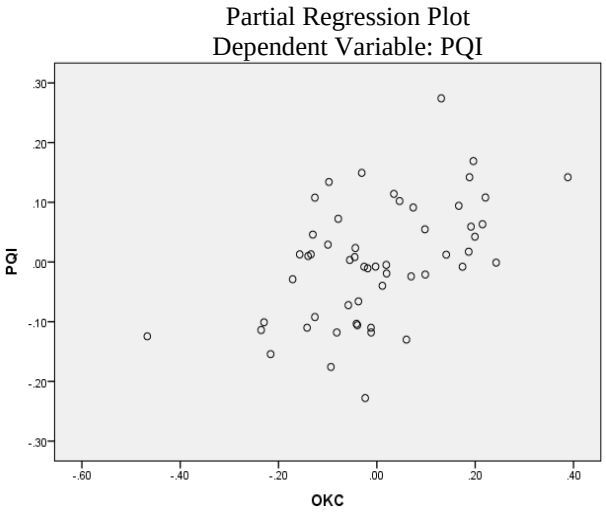


Figure 5.27: Multiple Regression Model Showing β Standardized Coefficient Values for PQI

The partial regression and 3D plot of all significant predictors' variables such as top management commitment, organization Kaizen culture, and training of workers is shown in Figure 5.29. The regression model explains 72.3% variation in dependent variable "product quality improvement" due to three independent variable included in the model.





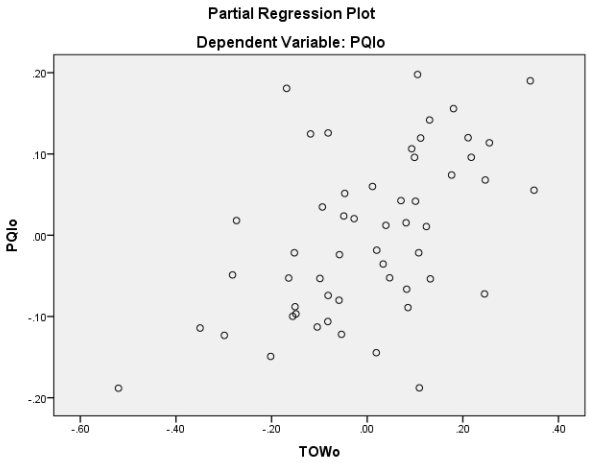


Figure 5.28: Partial Regression Plot for DV of Kaizen PQI

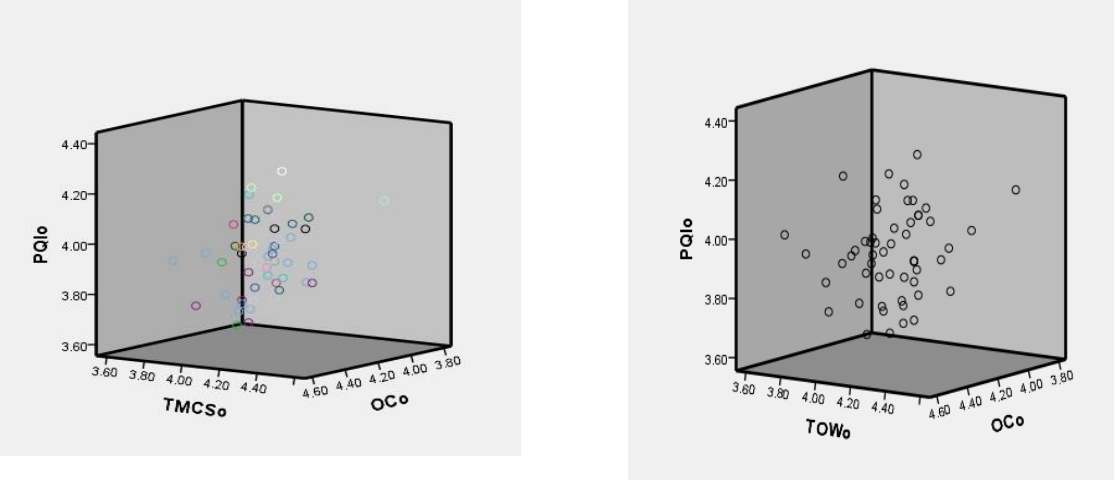


Figure 5.29 3D Plot of TMC, OKC, TOW & PQI

5.10 **Testing of Hypothesis H3d - Building Regression Model for OIPI**

H0: Organizational internal process improvement through Kaizen is not significantly affected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative of employees, reward and recognition, training of workers on Kaizen tools and techniques, Kaizen event & team design.

The alternate hypothesis H3d says that organizational internal process improvement through Kaizen is affected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, rewards and recognition, training of workers and Kaizen event & team design. To confirm the hypothesis, regression model for

dependent variable "organizational internal process improvement" was developed. Before the development of regression model, confirmation of pre-requisites were ensured.

First assumption regarding linearity of the data was confirmed through drawing scatter plot, normal P-P Plot of observed-cum-probable values against expected-cum-probable values of data observed against dependent variable "product quality improvement" as shown in Figure 5.30. The plot confirms the linearity of data for selection of multiple linear regression analysis.

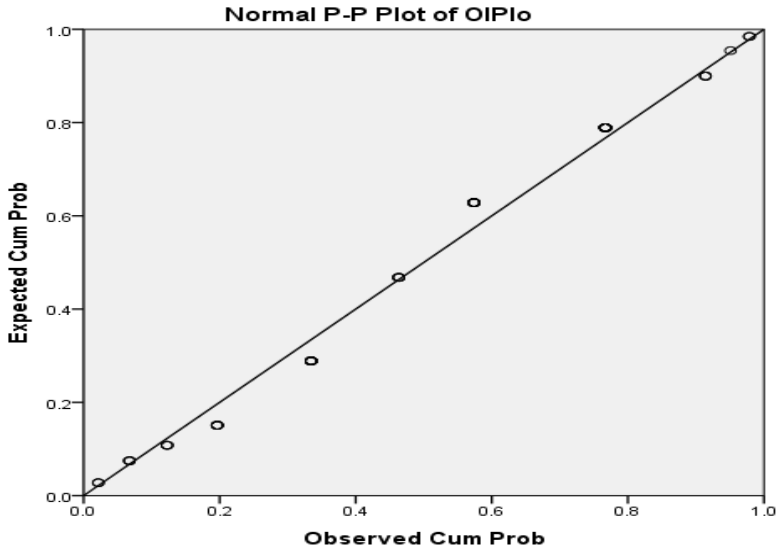


Figure 5.30: Normal P-P Plot between Observed & Expected Values of OIPI

Similarly, to confirm that errors are normally distributed, histogram and normal P-P plot of regression standardized residual for dependent variable, organization internal process improvement were drawn. Results are shown in Figure 5.31. The result shows that errors are normally distributed along the diagonal line and histogram also confirms normal distribution of regression standardized for outcome variable "organizational internal process improvement".

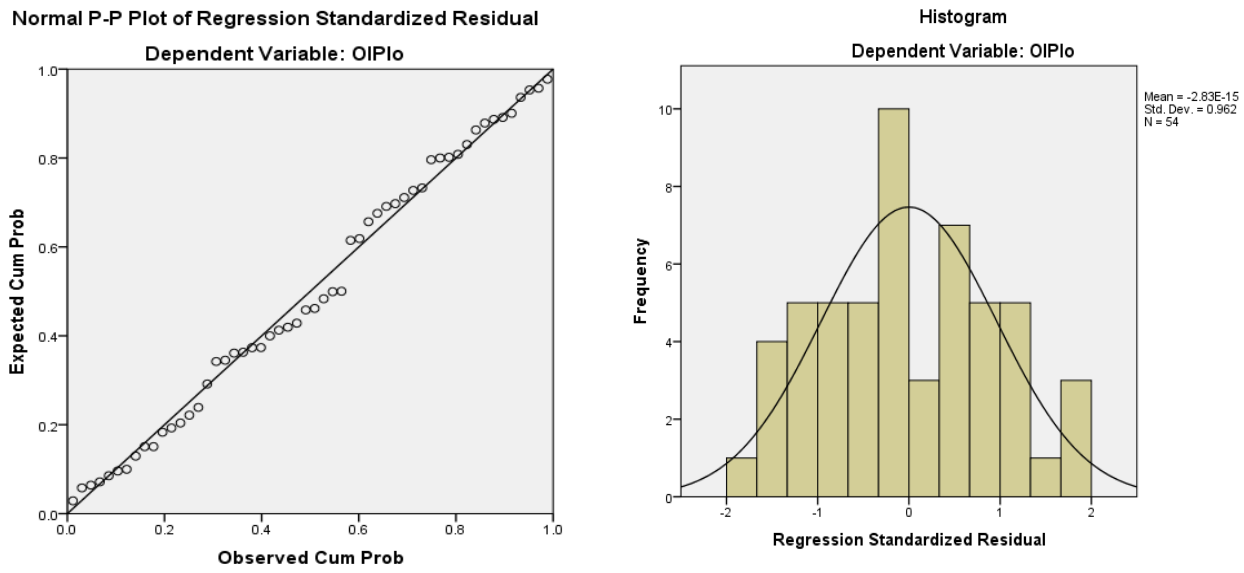


Figure 5.31: Histogram & Normal P-P Plot of Regression Standardized Residual for OIPI

Third assumption that variances are constant was met by plotting studentized residual plot versus predicted values for dependent variable organizational internal process improvement shown in Figure 5.32. The plotted values do not show exact pattern or shape and data is not spread large enough, i.e. 95% of residual error values fall within range of ±2. The histogram shows that the values of regression standardized residual are normally distributed confirming the third assumption of multiple regression analysis.

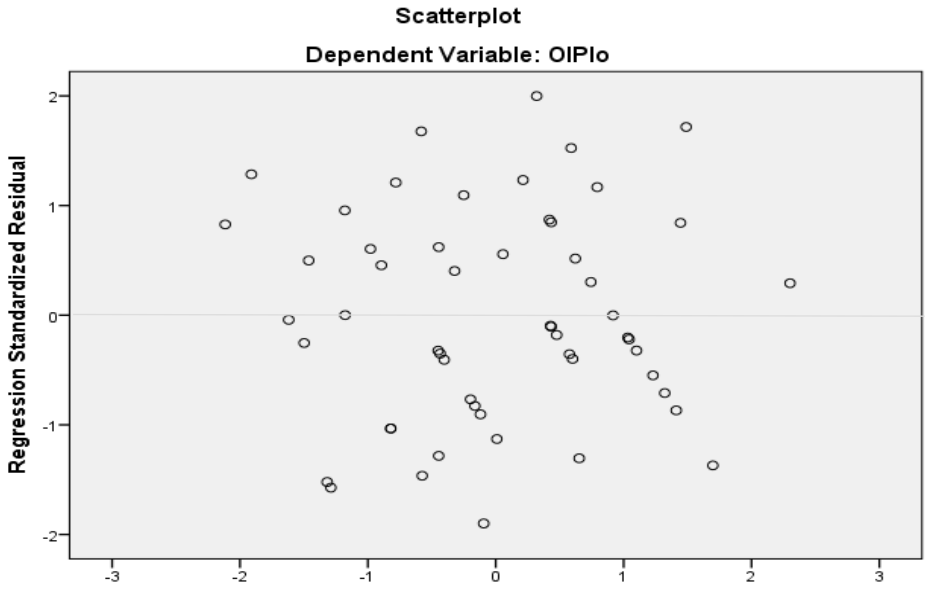


Figure 5.32: Scatter plot of Regression Standardized Residual Values of OIPI

The **fourth assumption** was confirmed by ensuring that respondents are not influenced by any external or internal involvement. The result of regression analyses for dependent variable "organizational internal process improvement" are shown in Table 5.22. The results indicate that there are two possible models for dependent variable "organizational internal process improvement". One having all six independent variables, whereas the second model have five independent variables.

Table 5.22: Model Summary for OIPI

Model	R	R^2	Adjusted R^2	Durbin-Watson
1	0.882	0.778	0.749	
2	0.882	0.778	0.755	0.995

The values of R^2 and adjusted R^2 for model two are 0.778 and 0.755 respectively. This mean, model 2 explains 75.5% of the variation in outcome variables "organizational internal process improvement" due to five independent variables, such as organization Kaizen culture, personal initiative of the employees, training of workers, reward and recognition given to the workers and Kaizen event & team design.

The F-statistic from ANOVA results, shown in Table 5.23, confirm that both models are significant having F values > 10. However *t* values of independent variables "top management commitment" lies between ± 2. (t = 0.013), which is not useful model. However all independent variables in model 2 have *t* values greater than +2. That means all five independent variables in this model are useful.

Table 5.23: F Statistics or ANOVA for OIPI

Model		Sum of Squares	Degree of Freedom (df)	Mean Square	F-Value	Significance
1	Regression	0.891	6	0.149	27.420	.000[b]
	Residual	0.255	47	0.005		
2	Regression	0.891	5	0.178	33.604	.000[c]
	Residual	0.255	48	0.005		

b. Predictors: (Constant), KETD, TOW, OKC, RR, PI, TMC

c. Predictors: (Constant), KETD, TOW, OKC, RR, PI

The beta coefficient values of all independent variables as determined through *t*-statistics for both models are shown in Table 5.24.

Table 5.24: *t*-Statistics and β Coefficient Values for OIPI

Model		Un-standardized beta Coefficients	Standardized beta Coefficients	t-Value	Significance
		B	B		
1	(Constant)	-.316		-.888	.379
	TMCS	.001	.001	.013	.989
	OKC	.104	.120	1.372	.177
	PI	.235	.255	2.786	.008
	RR	.195	.221	2.468	.017
	TOW	.334	.455	5.444	.000
	KETD	.166	.160	1.720	.092
2	(Constant)	-.317		-.913	.366
	OKC	.204	.220	2.396	.049
	PI	.235	.255	2.894	.006
	RR	.195	.221	2.603	.012
	TOW	.334	.455	5.622	.000
	KETD	.206	.210	2.045	.048

The schematic view showing standardized beta coefficient values of best suitable multiple regression model developed for dependent variable "organizational internal process improvement" is shown in Figure 5.33.

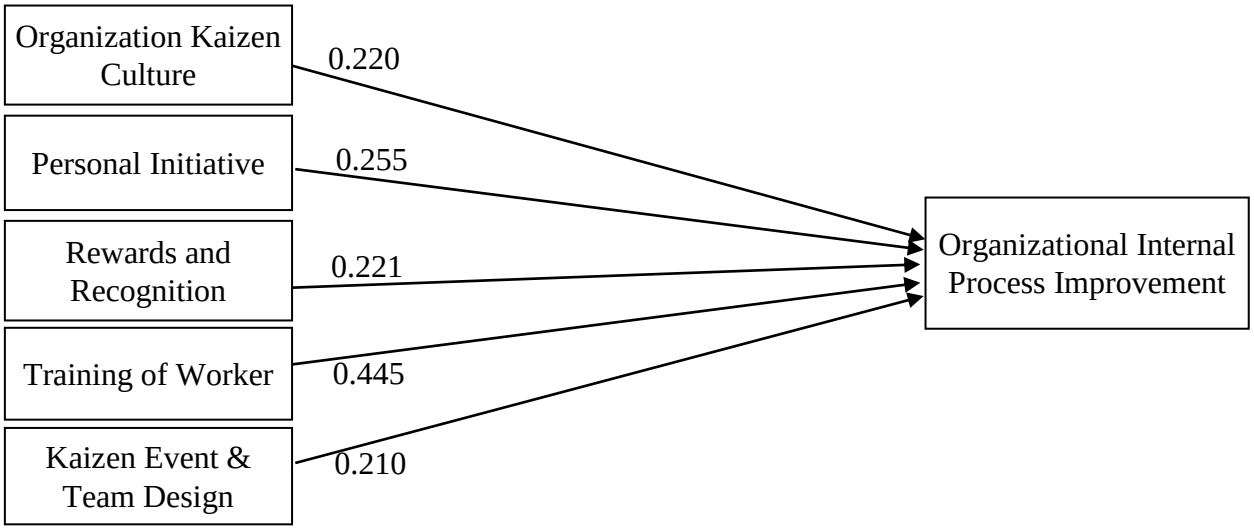


Figure 5.33: Multiple Regression Model Showing β Standardized Coefficient Values for OIPI

Linear equation for best selected regression model having standardized beta coefficient values is given as under:-

OIPI= -.317+0.220*OKC+0.255*PI +0.221*RR +0.455*TOW +0.210*KETD (5.10)

The final model represent that

Adjusted R square = .755; $F_{5, 48} = 33.6$, P < 0.0005 (using backward selection method).

Significant variables are shown below.

Predictor Variable	**Beta**	**p**
Organizational Kaizen culture	.220	< 0.0005
Personal Initiative	.255	< 0.0005
Rewards and recognition	.221	< 0.0005
Training of workers	.455	< 0.0005
Kaizen event and team design	.210	< 0.0005

This model can explain 75.5% variations in outcome variable "organization internal process improvement" due to variation in independent variables of Kaizen like organization Kaizen culture personal initiative, rewards and recognition, training of workers and Kaizen event and team design respectively. So, the null hypotheses is rejected and alternate hypothesis i.e. outcome variable "organization internal process improvement" due to Kaizen implementation is affected by variation in independent variables of Kaizen such as organization Kaizen culture, personal initiative, rewards & recognition, training of workers and Kaizen event & team design is accepted.

The partial regression plots for organizational internal process improvement and five independent variables organization Kaizen culture, personal initiative, rewards and recognition, training of workers and Kaizen event & team design are shown in Figure 5.34.

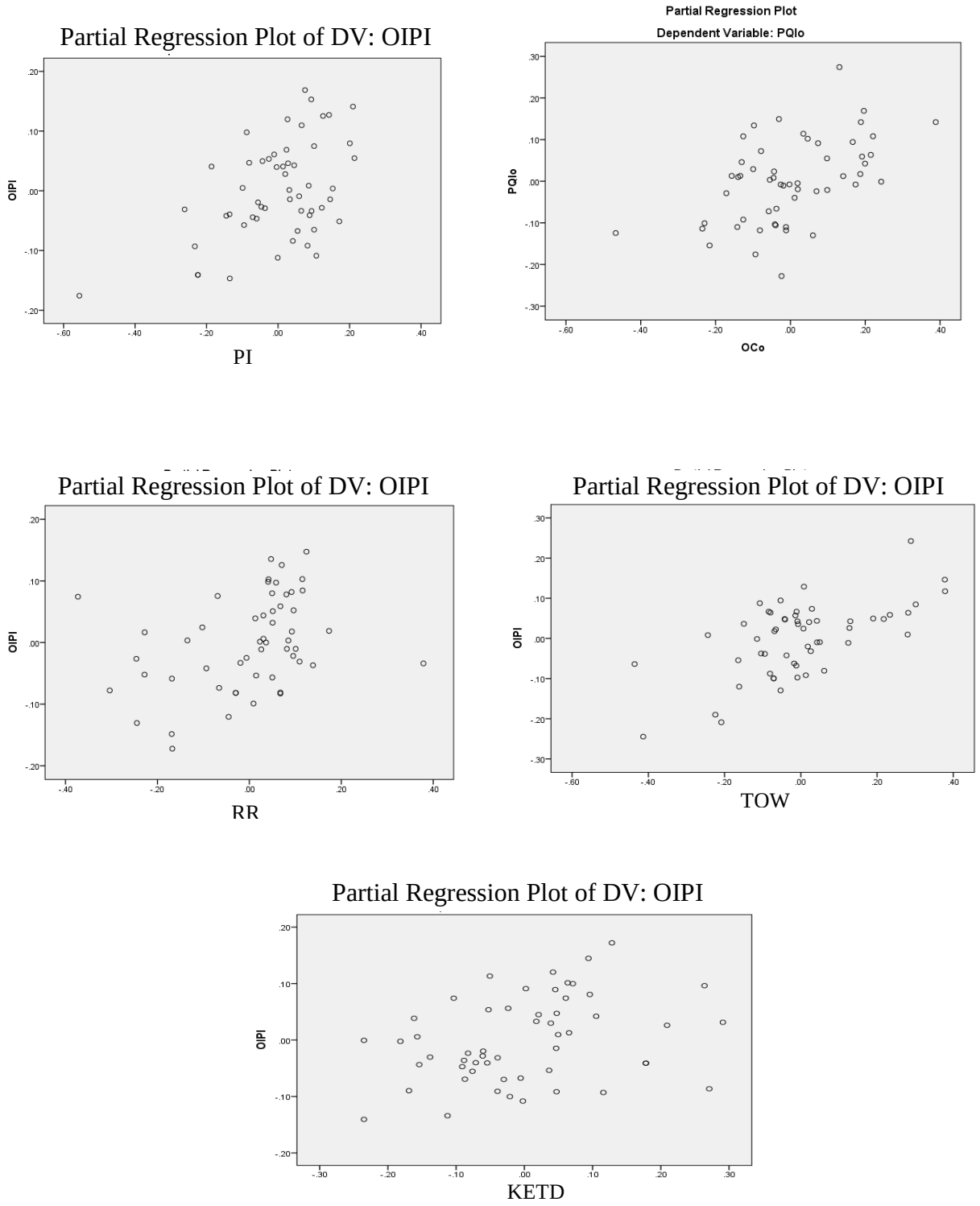


Figure 5.34: Partial Regression Plot for OIPI

5.11 **Testing of Hypothesis H4 - Building Regression Model for OSK**

H0: Overall success of Kaizen is not significantly contributed by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative, reward and recognition, training of workers and Kaizen event & team design.

In order to test the hypothesis, multiple linear regression model was developed. Before building a regression model for dependent variable "overall success of Kaizen", four basic assumptions for regression model were confirmed. Details for confirmations of assumptions of regression model are given as under:-

First assumption Linearity of the data was confirmed through Scatter and normal P-P plot as shown in Figure 5.35. The figure shows that data is suitable for linear regression analysis.

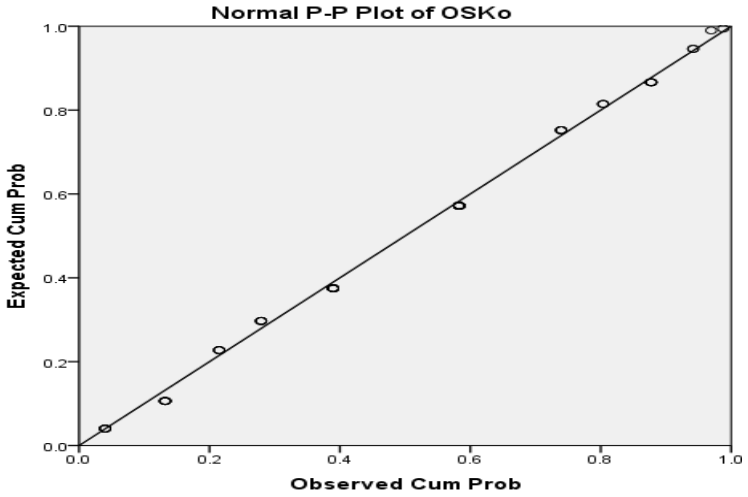


Figure 5.35: Normal P-P Plot for OSK

Similarly, to confirm that errors are normally distributed, p-p plot and histogram of studentized residual for dependent variable "overall success of Kaizen" were developed. Results are shown in Figure 5.36. The graph shows that the residual error is normally distributed. Although slight deviation from normality is observed however, this deviation is not sever enough to avoid use of linear regression analysis. Hence the **second assumption** confirms.

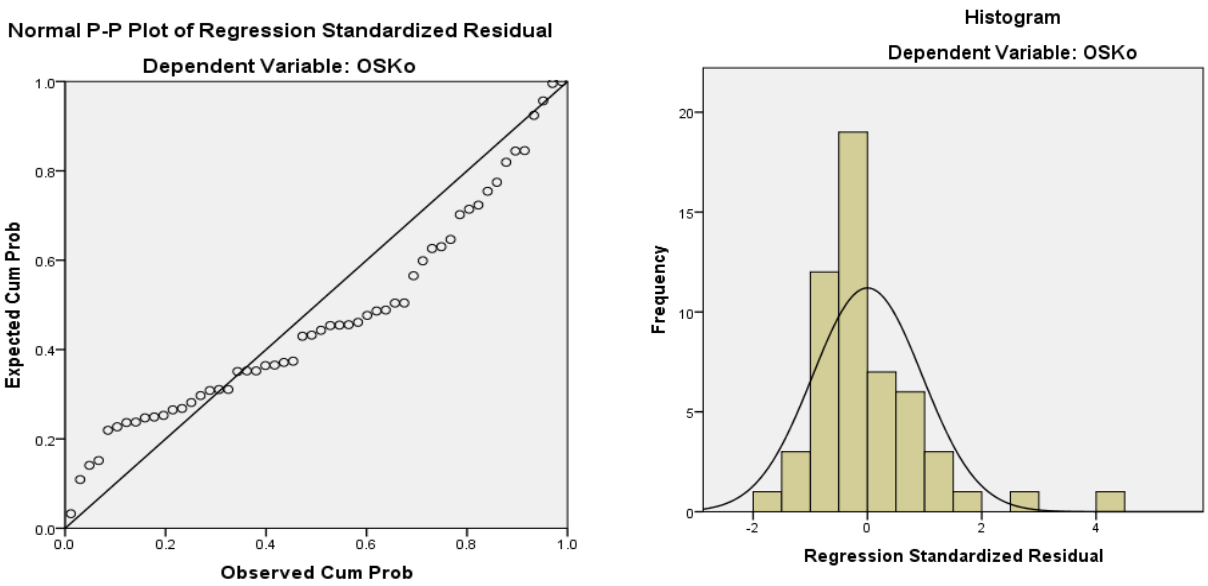


Figure 5.36: Histogram & Normal P-P Plot for OSK

Third assumption, that variance in error is constant was confirmed by plotting scatter plot of regression standardized residual for outcome variable "overall success of Kaizen" as shown in Figure 5.37. The scatter plot confirms that error is within a value of ±2 and no specific pattern is being formed. Hence, the third assumption is confirmed.

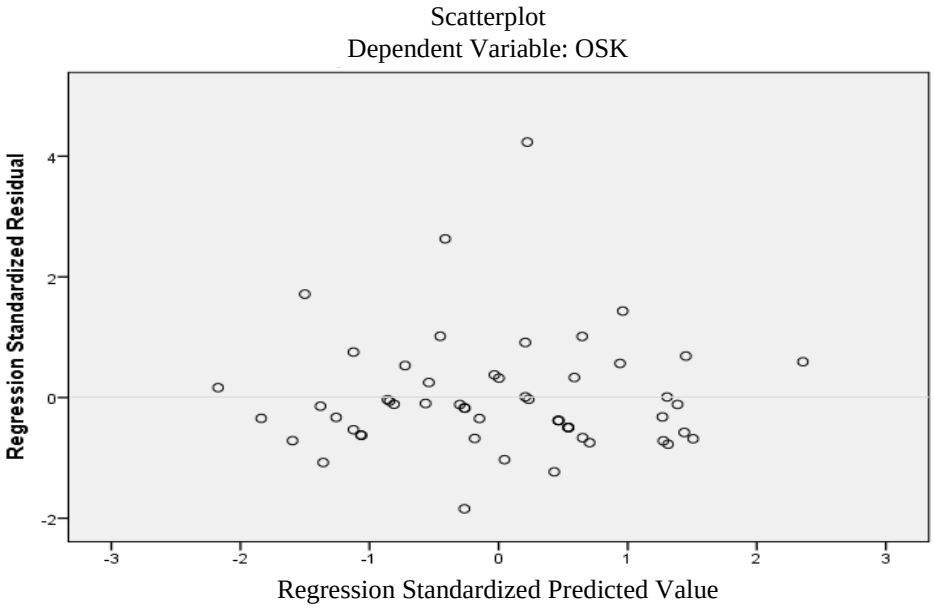


Figure 5.37: Scatter Plot of Regression Standardized Residual Values for OSK

For the confirmation of **fourth assumption**, the perceptions of the respondents were measured independently. The researcher has no influence on the respondents regarding response of the survey question. After confirmation of all four assumptions, a linear multiple regression was performed. The results of multiple linear regression analysis are shown in Table 5.25. Three possible models contains 6, 5 and 4 numbers of independent variables of Kaizen respectively.

Table 5.25: Regression Model Summary for OSK

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	0.849	0.720	0.685	
2	0.849	0.720	0.691	
3	0.846	0.715	0.692	1.459

The values of R^2 and adjusted R^2 for model one is 0.720 and 0.685 respectively, whereas the values of R^2 and adjusted R^2 for model three are 0.715 and 0.692, respectively. This means model three explains 69.2% of the variation in the outcome variables overall success of Kaizen, develop by four independent variables of Kaizen, top management commitment, personal initiative, training of workers and reward & recognition indicating a good regression model.

ANOVA result or F statistic shown in table 5.26 indicates that all the three models are significant having F > 10. However, *t* values for independent variables top management commitment and organization Kaizen culture lies between ± 2 for model 1 which is not useful for a good model. The *t* values for all independent variables in model three are significant.

Table 5.26: F- Statistics or ANOVA for OSK

Model		Sum of Squares	Degree of Freedom (df)	Mean Square	F-Value	Significance
1	Regression	0.749	6	0.125	20.192	.000[b]
	Residual	0.291	47	0.006		
2	Regression	0.749	5	0.150	24.729	.000[c]
	Residual	0.291	48	0.006		
3	Regression	0.744	4	0.186	30.772	.000[d]
	Residual	0.296	49	0.006		

b. Predictors: (Constant), KETD, TOW, OKC, RR, PI, TMC
c. Predictors: (Constant), KETD, TOW, RR, PI, TMC
d. Predictors: (Constant), TOW, RR, PI, TMC

Model three can explain 69.2% variations in dependent variable "overall success of Kaizen", contributed by four independent variables. Thus, the null hypothesis is rejected and alternate hypothesis is accepted. That means "overall success of Kaizen" is affected by the independent variables top management commitment, personal initiative taken by the employees, rewards & recognition and training of workers of the organization on Kaizen tools & techniques.

Table 5.27: *t*- Statistics or β Coefficient values for OSK

Model		**Unstandardized Coefficients**	**Standardized Coefficients**	**t-Value**	**Significance**
		β	β		
1	(Constant)	.333		.874	.386
	TMC	.178	.226	1.862	.069
	OKC	.012	.015	.152	.880
	PI	.186	.211	2.057	.045
	RR	.178	.212	2.111	.040
	TOW	.255	.364	3.891	.000
	KETD	.091	.092	.882	.382
2	(Constant)	.347		.948	.348
	TMC	.179	.228	1.909	.062
	PI	.191	.218	2.378	.021
	RR	.177	.212	2.129	.038
	TOW	.255	.364	3.930	.000
	KETD	.094	.095	.934	.355
3	(Constant)	.490		1.477	.146
	TMC	.221	.281	2.672	.010
	PI	.200	.228	2.504	.016
	RR	.184	.219	2.220	.031
	TOW	.253	.361	3.909	.000

The Equation for final multiple regression model developed for dependent variable overall success of Kaizen showing standardized beta coefficient values is given as under:-

OSK = 0.490 + 0.281 *TMC + 0.228 * P I + 0.219 * RR + 0.361 * TOW (5.11)

The final model represent that

Adjusted R square = .692; $F_{3, 43} = 30.7$, $P < 0.0005$ (using backward selection method).

Significant variables are shown below.

Predictor Variable	**Beta**	**p**
Top management commitment	.281	< 0.0005
Personal Initiative	.228	< 0.0005
Rewards and recognition	.219	< 0.0005
Training of workers	.316	< 0.0005

The schematic view of the final model showing the standardized beta coefficient values of all four independent variables is shown in Figure 5.38.

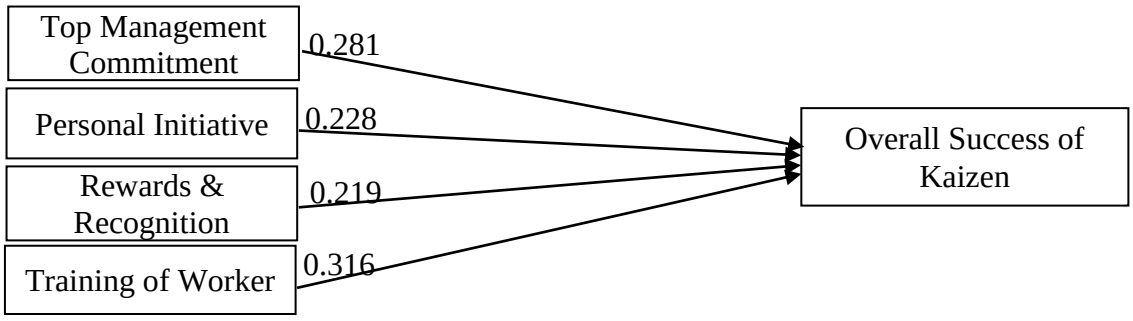
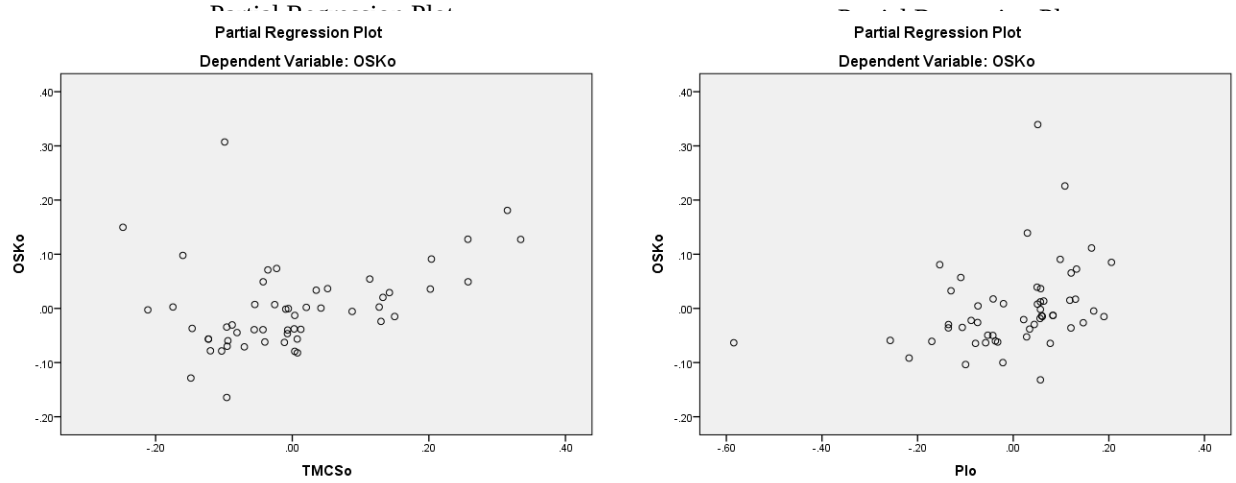


Figure 5.38: Multiple Regression Model Showing β Standardized Coefficient Values for OSK

The partial regression plots for overall success of Kaizen and four independent variables top management commitment, personal initiative, training of workers, reward and recognition given to participant of Kaizen activities are shown Figure 5.39.



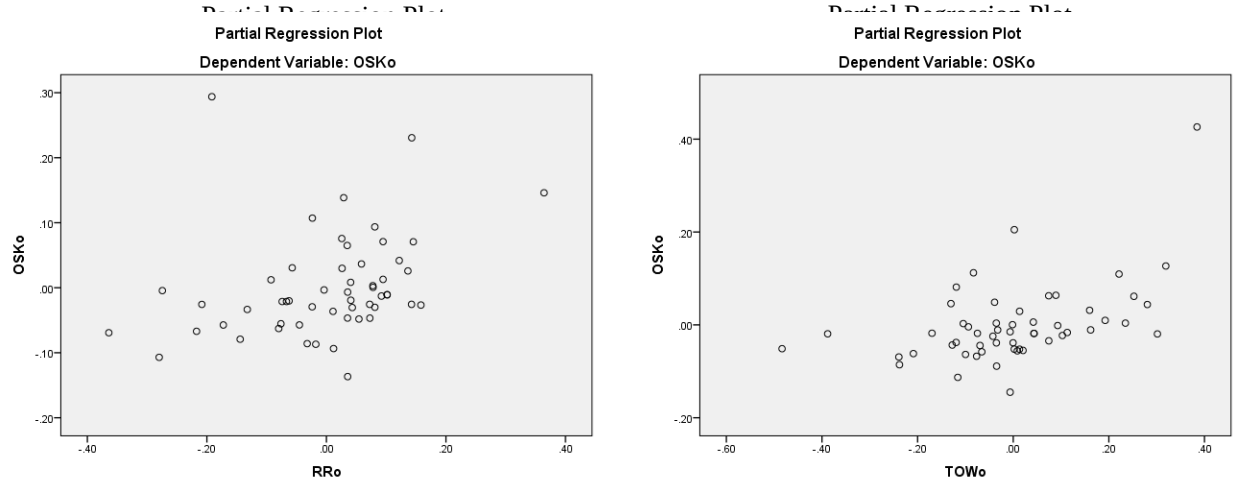


Figure 5.39: Partial Regression Plots for OSK

5.12 **Summary of all Regression Models**

Different percentages of variations in each dependent variable was explained amicably by each developed model. 76.7% variations in outcome variable of Kaizen named "human resource development" were explained by 1st models consists of four independent variables, top management commitment, organizational Kaizen culture, rewards & recognition and training of workers. This means that outcome variable, "human resource development" is affected by above mentioned four independent variables out of six.

72.0% variation in outcome variable "work area improvement" was explained by 2nd model having three independent variables, organizational Kaizen culture, rewards & recognition and training of workers. It means that the outcome variable work area improvement is affected by above mentioned three independent variables significantly.

Third model explains 72.3% variation in dependent variable "product quality improvement" having three independent variables, i.e. top management commitment, organizational Kaizen culture and training of workers. So the outcome variable, "product quality improvement" was affected by above mentioned three independent variables. 75.50% variations in dependent variable "organization internal process improvement" were explained by fourth model having five independent variables, organization Kaizen culture, rewards and recognition, training of workers, personal initiative and Kaizen event & team design. So the outcome variable "organization internal process improvement" was affected by these five independent variables. The fifth and final model can explain 69.2% variations in dependent variable "overall success of

Kaizen" contributed by variation in four independent variables, e.g. top management commitment, rewards & recognition, training of workers and personal initiative. So the outcome variable, "overall success of Kaizen" was effected by four above mentioned independent variables.

The independent variable training of workers was found to have significant positive effect (having standardized β coefficient values ranges from 0.269 to 0.549) on all dependent variables of Kaizen. Independent variables, Kaizen event and team design has only significant positive effect (having standardized β coefficient value of 0.210) on dependent variable organizational internal process improvement. None of other dependent variable is affected by the independent variable, Kaizen event and team design. The independent variable, "top management commitment" has strongest effect than all other independent variables on product quality improvement through Kaizen. Summary of all models along with standardized β coefficient values are shown in Table 5.28.

Table 5.28: Summary of Multiple Regression Models for Outcome Variable of Kaizen

Variables of Adjusted R^2	**TMC**		**OKC**		**RR**		**TOW**		**PI**		**KETD**	
	β	**P Value**	**β**	**P Value**	**β**	**P Value**	**β**	**P Value**	**B**	**P Value**	**β**	**P Value**
HRD (76.7%)	0.432	.000	0.206	.008	0.242	.007	0.269	.002	-	-	-	-
WAI (72.0%)	-	-	0.251	.002	0.315	.001	0.549	.000	-	-	-	-
PQI (72.3%)	0.428	.000	0.338	.000	-	-	0.350	.000	-		-	
OIPI (75.0%)	-	-	0.220	0.049	0.221	.012	0.455	.000	0.255	.006	0.210	.048
OSK (69.2%)	0.281	.010	-		0.219	.031	0.361	.000	0.228	.016	-	

The summary indicates that the independent variables, top management commitment, organizational Kaizen culture, rewards & recognition and training of workers have strong effects on all outcome variables of Kaizen. It means that effective implementation of Kaizen in an organization depends upon commitment from top management, favorable organizational Kaizen culture, reward and recognition given to employees and training of workers to enhance their skill level and knowledge of Kaizen tools and techniques. Above mentioned IVs contribute significantly in overall success of Kaizen in an organization.

5.13 **Testing of Hypothesis H5 - Mediation Effect of PV between IV and OSK**

Mediation or indirect relationship occurs when the causal relationship between dependent variable *'y'* and independent variable *'x'* is transmitted through mediator 'm' (Jackson & Wall, 1991). This can be explained by the fact that the independent variable 'x' affect the dependent variable "y", because 'x' affects mediator and mediator in turn affects the dependent variable 'y'. Mediation sometimes also called indirect effect of independent variable on dependent variable and they are often used interchangeability (Muller, Judd, & Yzerbyt, 2005). There are different ways of showing mediation model hypotheses. In this research, effects of independent variables on outcome variable "overall success of Kaizen" are mediated through process variable employee's commitment to Kaizen and standardizations of organizational internal process. The hypotheses related to mediation of process variables between independent variable and overall success of Kaizen was tested through multiple regression analyses. Multiple regression analysis was performed to assess the direct and indirect relationship among variables of interest for testing of hypothesis.

A process variable related to employees of the organization working as Kaizen team member was generated by calculating mean value of four factors related to employees of the organization and standardization of the organizational internal processes. Since all four factors are related to employee's knowledge, commitment and action associated with Kaizen, therefore either these factors expedite or slow down the Kaizen implementation process in an organization. Factors such as action taken by the employees, their commitment to Kaizen activities, their knowledge regarding Kaizen tools and techniques and their assurance that after each improvement activity the new processes are standardized can be combined to generate a single process variable related to employees of the organization. Therefore, the mean value of these four factors was calculated to generate a single variable known as mediator variable. The overall success of Kaizen was used as criterion variable whereas mean value of process variables was used as mediator. Six different factors affecting overall success of Kaizen were used as independent variables. Mediation analyses was carried out basing on criteria given by (Baron & Kenny, 1986). Description regarding mediation variable used to test the hypotheses is illustrated in Figure 5.40.

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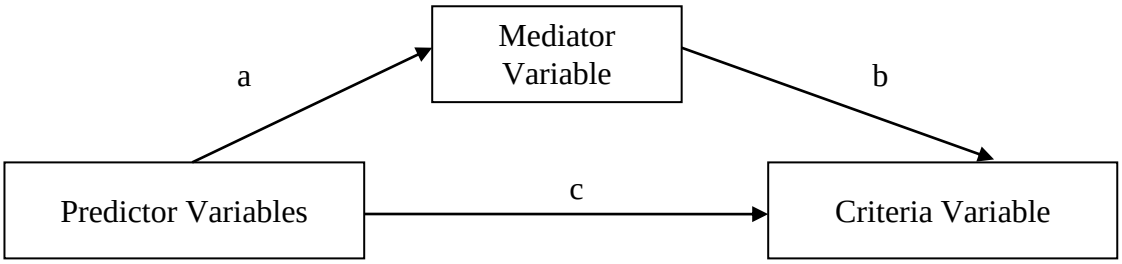

Figure 5.40: Mediation Paths as given by Baron and Kenny (1986)

As per Baron and Kenny (1986) a variable will act as a mediator when following conditions are fulfilled:-

a. Independent or predictor variables have significant relationship with dependent or criteria variable. In other words, a variation in level of independent variables is significantly accounted for variation in level of criterion or dependent variable. It means that path 'c' shown in Figure 5.40 must be significant.

b. A variation in level of independent variables significantly accounts for variation in presumed mediator variable. Path 'a' shown in Figure 5.40 must be significant. In other words, there is a significant relationship between predictor and presumed mediator variable.

c. Variation in presumed mediator variable is significantly accounted for variation in dependent or criterion variable. In other words, there is a significant relationship between presumed mediator and dependent or criterion variable. Path 'b' shown in Figure 5.40 must be significant.

d. When path 'a' and 'b' are controlled, the significant relationship between predictor and criterion variables of Kaizen indicated by path 'c' is reduced and becomes non-significant. Strongest mediation between predictor and criteria variable occurs when the previously significant relationship becomes zero or non-significant. Similarly partial mediation occurs when this significant relationship is reduced significantly.

The testing of stated hypotheses related to mediation analyses is given as follows:-

H5a: There is significant direct relationship between each independent variables of Kaizen and dependent variable "Overall Success of Kaizen" in an organization.

Relationship between predictors and criterion variables was assessed conducting multiple regression analysis. The results of regression analyses are shown in Table 5.27.The regression model developed for overall success of Kaizen explains 69.2% variation in OSK due to variation in four selected IVs of Kaizen. The regression model shows that the four independent variables TMC, PI, TOW and RR have significant direct relationship with dependent variable "overall success of Kaizen". So these four independent variables fulfill the first requirement of mediation testing. Whereas two independent variables, "OKC" and "KETD" do not have significant relationship with dependent variable "OSK".Therefore, next step for mediation testing cannot be performed for these two IVs.

Contributions of each predictor to outcome variable "OSK" and its significant value is given by t-statistics. The value of β coefficient for independent variable "top management commitment" having p value 0.001 shows that it has significant co-relation (β=0.226,t = 2.062 & p = < 0.05) with overall success of Kaizen. Schematic view of this relationship is shown in Figure 5.41.

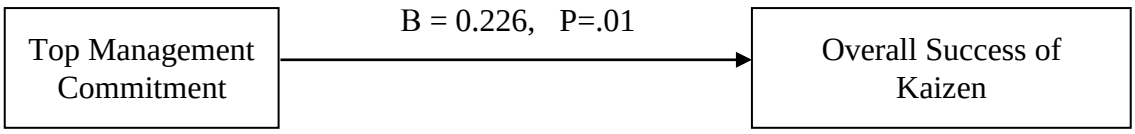

Figure 5.41: Direct Relationships between TMC and OSK

Similarly, P value for predictor variable "organization Kaizen culture" is 0.889 which means organizational Kaizen culture has no significant correlation (β = 0.015, t =0.152 & p > 0.05) with overall success of Kaizen. The schematic view of this relationship shown in Figure 5.42 and indicates a non-significant contribution of organization Kaizen culture with overall success of Kaizen.

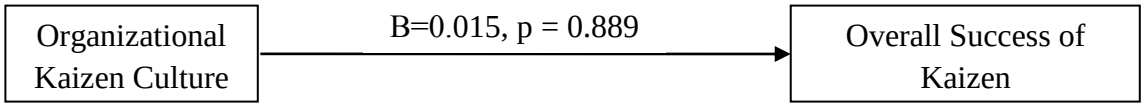

Figure 5.42: Direct Relationships between OKC and OSK

The P value for predictor variable "personal initiative" is 0.045 < 0.05 which means personal initiative has significant correlation (β = 0.211, t = 2.057 & p = < 0.05) with overall success of Kaizen. This factor can be selected for further mediation analysis. The schematic view

of this relationship shown in Figure 5.43 indicates significant direct relationship of personal initiative with overall success of Kaizen.

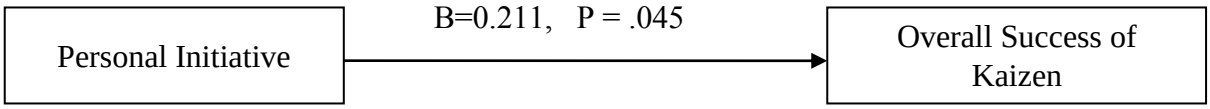

Figure 5.43: Direct Relationships between PI and OSK

The P value for predictor variable "reward and recognition" is 0.040 > 0.05 which means reward and recognition has significant correlation (β= 0.212, t = 2.111 & p < 0.05) with overall success of Kaizen. This factor can be selected for further mediation analysis. The schematic view of this relationship shown in Figure 5.44 indicates significant direct relationship of reward and recognition with overall success of Kaizen in an organization.

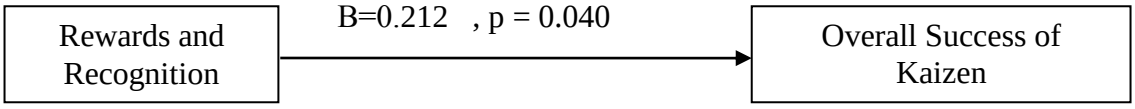

Figure 5.44: Direct Relationships between RR and OSK

The P value for predictor variable training of workers is 0.000 < 0.05 which means training of workers has significant correlation coefficient value (β=0.364, t=3.891 & p = < 0.01) with overall success of Kaizen. This factor can be selected for further mediation analysis. The schematic view of this relationship as shown in Figure 5.45, indicates significant direct relationship of training of workers with overall success of Kaizen.

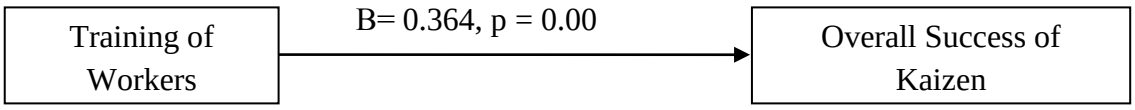

Figure 5.45: Direct Relationships between TOW and OSK

The P value for predictor variable "Kaizen event & team design" is 0.382 > 0.005 which means Kaizen event and team design has no-significant relationship (β = 0.092, t = 0.882 and p > 0.05) with overall success of Kaizen, therefore, this factor is excluded from further analysis for mediation testing. The schematic view of this relationship, shown in Figure 5.46, indicates weak relationship of Kaizen event & team design with overall success of Kaizen.

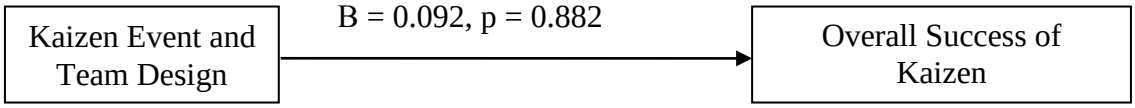

Figure 5.46: Direct Relationships between KETD and OSK

Four out of six independent variables of Kaizen have significant relationship with overall success of Kaizen. As per Baron and Kenny (1986), these four independent variables fulfill the first pre-requisite of mediation analysis.

H5b: There is significant direct relationship between each independent variables such as TMC, PI, RR, TOW and aggregate process variable of Kaizen in an organization.

To confirm the second requirement of mediation analysis multiple regression analyses for process variable was performed. The results of regression analysis are shown in Table 5.29.

Table 5.29: Model Summary for PV

Model	R	R Square	Adjusted R Square
1	0.833	0.694	0.670

The value of adjusted R^2 is equal to 0.670. That mean this model is good enough to explain 67% variations in process variable score level due to variation in predictor variables.

t-statistic shown in Table 5.30, indicates significant value of standardized β coefficient for top management commitment is 0.469, personal initiative is 0.195, training of workers is 0.251, and significant beta coefficient value for IV rewards & recognition is 0.165 having p values 0.045 < 0.05. Hence path 'a' is significant fulfilling the second requirement of mediation.

Table 5.30: *t* Statistics and βo Coefficients Value of IV for Mediation Analysis

Model	Unstandardized Coefficients	Standardized Coefficients	t-Value	Significance
	β	β		
(Constant)	.775		2.404	.020
TMC	.345	.469	4.305	.000
PI	.144	.195	1.956	.050
RR	.153	.198	1.964	.045
TOW	.165	.251	2.624	.012

Dependent Variable: Process variable (PV)

H5c: There is significant direct relationship between aggregate process variable and OSK in an organization.

The third criterion for mediation testing was assessed through multiple regression analysis between process variable acting as a mediator and "overall success of Kaizen" path "b'. The result of regression analyses shows the value of β coefficient between mediators and dependent variables, overall success of Kaizen is 0.740 and p value is 0.000 which mean significant relationship between mediator and dependent variable, "OSK". The model summary shows that 54% variations in score of outcome variable OSK is accounted for by the regression model due to variation in score of aggregate process variable. This value shows that regression model is good enough. Hence, third requirement of mediation testing is fulfilled.

Table 5.31: *t* Statistics or β Coefficients values for PV

Model	**Unstandardized Coefficients**	**Standardized Coefficients**	**t-Value**	**Significance**
	β	**β**		
(Constant)	.905		2.341	.023
PV	.790	.740	7.944	.000

Table 5.32: Model Summary OSK

Model	**R**	**Adjusted R^2**
1	0.740[a]	0.540

a. Predictors: (Constant), PV

b. Dependent Variable: OSK

H5d: The aggregate process variable mediate the relationship between independent variables such as top management commitment, personal initiative taken by employees of the organization, rewards & recognition and training of workers and OSK in an organization.

Fourth criterion for the mediation test, path "c" (when path "a" and "b" are controlled) was checked through multiple regression analysis. The result indicates that the previously significant path "**c**" as discussed earlier has become non-significant due to reduction in beta coefficient values from 0.281 to 0.207 for top management commitment, from 0.228 to 0.200 for

personal initiative, 0.219 to 0.197 for rewards and recognition and 0.361 to 0.322 for training of workers. The result of t-statistics indicates that all *βo* coefficient values have become non-significant except *βo* coefficient value for independent variable training of workers which is also reduced but not up to non-significant level.

Table 5.33: *t*-Statistics or β Coefficient values for DV, OSK

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.490	.332		1.477	.146
	TMC	.221	.083	.281	2.672	.010
	PI	.200	.080	.228	2.504	.016
	RR	.184	.083	.219	2.220	.031
	TOW	.253	.065	.361	3.909	.000
2	(Constant)	.361	.350		1.031	.308
	TMC	.163	.097	.207	1.686	.098
	PI	.176	.082	.200	2.136	.038
	RR	.165	.084	.197	1.958	.056
	TOW	.225	.069	.322	3.272	.002
	APV	.167	.147	.157	1.140	.260
a. Dependent Variable: OSK						

The multiple regression model develop to test the mediation effect of aggregate process variable between IV and OSK can explain 68.5% variation in score level of outcome variable "overall success of Kaizen".

The new model after having mediation effect represent that

Adjusted R square = .685; $F_{4, 43} = 30.7$, P > 0.005 (using Enter method).

Non-significant variables are shown below.

Predictor Variable	**Beta**	**p**
Top management commitment	.207	> 0.005
Personal Initiative	.200	> 0.005
Rewards and recognition	.197	> 0.005
Training of workers	.322	> 0.005

Since value of beta coefficient reduced up to non-significant level, the mediator variable fully mediate between independent variables such as, TMC, PI, RR and overall success of Kaizen. However, the beta coefficient values of the variables TOW reduced but not up to the non-significant level. Hence, mediator (aggregate process variable) partially mediates the relationship between independent variables TOW and overall success of Kaizen. The APV does not have significant mediation affect between independent variables, e.g. OKC, KETD and overall success of Kaizen. So the hypothesis H5 is partially accepted. The schematic view of partial mediation effect of aggregate process variable between predictor variables and overall success of Kaizen is shown in Figure 5.47 to 5.50.

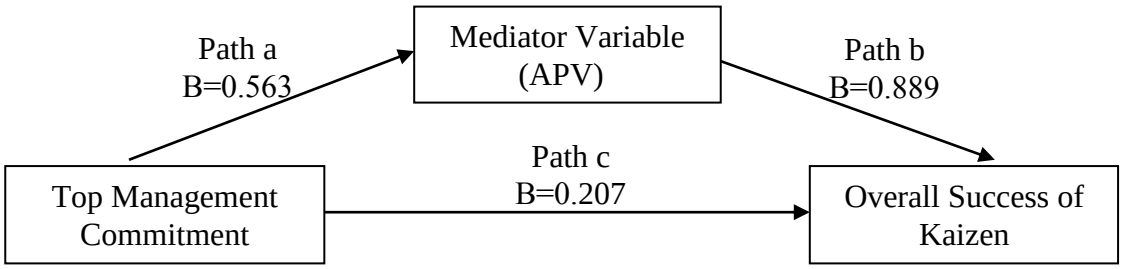

Figure 5.47: Mediation of PV between TMC and OSK.

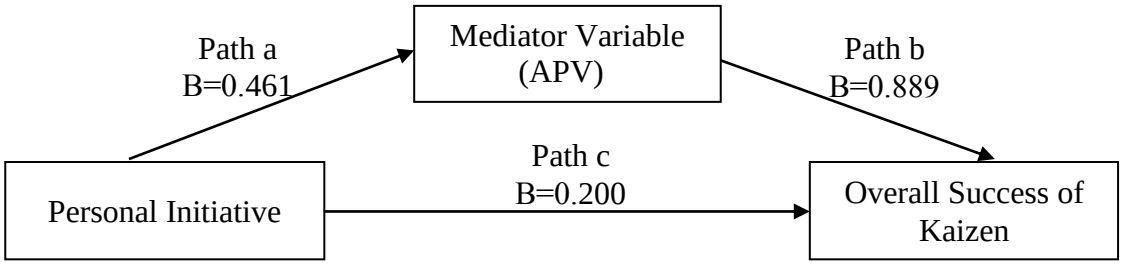

Figure 5.48: Mediation of PV between PI and OSK.

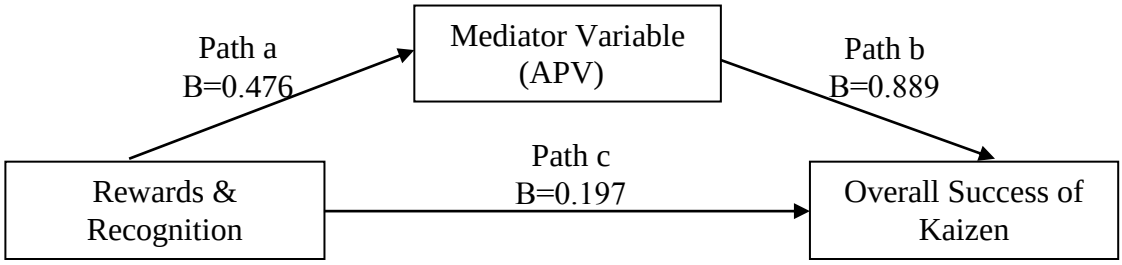

Figure 5.49: Mediation of PV between RR and OSK.

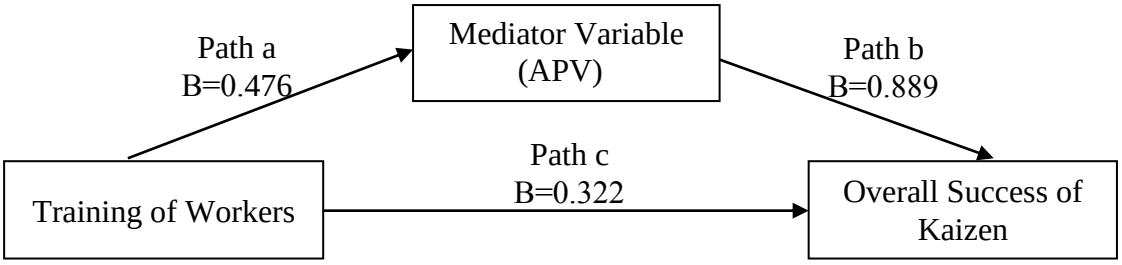

Figure 5.50: Partial Mediation of PV between TOW and OSK.

The results of mediation analysis of employees commitment to kaizen between IV and OSK indicates that there is slight reduction in beta coefficient values of input variables such as TMC, PI, RR, TOW when control through process variable "ECK". Mediation analysis results of employees commitment to Kaizen between IV and OSK are given in table 5.34.

Table 5.34: *t*-Statistics -β Coefficient Values for mediation effect of ECK between IV and OSK

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		β	**Std. Error**	β		
1	(Constant)	.490	.332		1.477	.146
	TMC	.221	.083	.281	2.672	.010
	PI	.200	.080	.228	2.504	.016
	RR	.184	.083	.219	2.220	.031
	TOW	.253	.065	.361	3.909	.000
2	(Constant)	.438	.332		1.319	.193
	TMCS	.164	.093	.209	1.770	.083
	PI	.180	.081	.205	2.232	.030
	RR	.179	.082	.213	2.169	.035
	TOW	.223	.068	.318	3.266	.002
	ECK	.131	.101	.153	1.301	.199
a. Dependent Variable: OSK						

The Result indicates that the process variable partially mediate relationship between IV of kaizen such as TMC, PI, RR, TOW and OSK in an organization. Similarly the results of multiple regression analysis to identify the mediation effect of standardization of organization internal process between Independent variables and overall success of Kaizen shows that it partially mediate the relationship between IV and OSK. The results are given in table 3.35. The multiple regression model develop to test the mediation effect of SOIP variable between IV and OSK can explain 70% variation in score level of outcome variable "overall success of Kaizen

Table 5.35: *t*-Statistics -β Coefficient values for mediation effect of SOIP between IV and OSK

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		β	Std. Error	β		
1	(Constant)	.490	.332		1.477	.146
	TMC	.221	.083	.281	2.672	.010
	PI	.200	.080	.228	2.504	.016
	RR	.184	.083	.219	2.220	.031
	TOW	.253	.065	.361	3.909	.000
2	(Constant)	.447	.326		1.368	.178
	TMC	.176	.085	.225	2.077	.043
	PI	.154	.083	.175	1.856	.070
	RR	.148	.084	.176	1.761	.085
	TOW	.241	.064	.344	3.778	.000
	SOIP	.154	.089	.186	1.721	.092
a. Dependent Variable: OSKo						

5.14 **Summary of Hypotheses Testing Results**

The summary of results of hypotheses testing using, i.e. Pearson correlation test, ANOVA standard and hierarchical multiple regression analysis are shown in Table 5.36.

Table 5.36: Summary of Hypotheses Testing Results

S/No	Hypotheses	Result
1.	**H1:** Each IV of Kaizen such as TMC, OKC, PI, RR, TOW and KETD have direct relationship with outcome variables of Kaizen, e.g. HRD, WAI, OIPI, PQI and OSK.	**Accepted**
2.	**H2:** Each PV such as ECK, AOK, EKTT and SOIP has direct relationship with outcome variables of Kaizen, e.g. HRD, WAI, OIPI PQI and OSK.	**Accepted**
3.	**H3a:** HRD through Kaizen in an organization is affected by IVs of Kaizen, i.e. TMC, OKC, PI, RR, TOW and KETD.	**Partially Accepted**
4.	**H3b:** WAI of an organization through Kaizen is affected by IVs of Kaizen, i.e. TMC, OKC, PI, RR, TOW and KETD.	**Partially Accepted**
5.	**H3c:** PQI through Kaizen is affected by IVs of Kaizen, i.e. TMC,	**Partially**

	OKC, PI, RR, TOW and KETD.	**Accepted**
6.	**H3d:** OIPI thorough Kaizen is affected by IVs of Kaizen, i.e. TMC, OKC, PI, RR, TOW and KETD.	**Partially Accepted**
7.	**H4:** OSK is affected by IVs of Kaizen, i.e. TMC, OCK, PI, RR, TOW and KETD.	**Partially Accepted**
8.	**H5:** APV of Kaizen partially mediate the relationship between IVs and OSK in an organization.	**Partially Accepted**

5.15 Discussion on Results

Before discussing the results of the research and its implications on automobile sector organizations, there are few points that need to be highlighted. Since this research study is based on observational and cross-sectional field study, therefore the direction of causality is based on theory and nature of measurement, i.e. the dependent variables measures the impact of effective implementation of Kaizen in an organization instead of controlled experimental results. In this research the outcome or dependent variables were measured through perceptions of individual respondents. Therefore, it is very difficult to explain the reverse causality, i.e. outcome variables caused by the measured value of independent variables, unless the outcome variables are proved through previous research and these variables are known by the respondents of the organization. Due to non-experimental nature of this research study the results cannot be totally denied.

Although perceptual measurement of the variables through survey is the precursor to hypothetically strong outcome, yet there are likely chances for contamination of causality effect of these measures due to the fact that they are measured as a perception of individual respondents regarding different variables of Kaizen. Finally, during observational study there is always a statistical relationship between variables because both independent and dependent variables are correlated with true unknown causes of outcome. The independent variables in any case do not measure the level of that cause.

In this research study, it was found that the independent variables of Kaizen, such as, top management commitment to Kaizen, organization Kaizen culture, personal initiative of the employees, rewards and recognition given to the workers along with the training of worker on Kaizen tools and techniques and design of Kaizen event & team, have impact on effective implementation of Kaizen in automobile sector organizations of Pakistan. Therefore,

organizations implementing Kaizen without consideration of these factors are subject to high degree of risk of failure of successful or effective implementation of Kaizen for long duration.

Literature review related to different factors affecting Kaizen implementation in different organizations reveal that most of the research on the topic is in the form of case studies. There exist little empirical research which may describe its effective implementation Kaizen in an organization (Moosa, 2008). The empirical research on implementation of Kaizen in Pakistani organizations is quite difficult because of following three reasons:-

a. There is a wide gap between researchers from universities who have very less practical experience and practitioner / consultants from the industries. In universities, students are given knowledge related to conceptual understanding of Kaizen philosophy, Kaizen event and different Kaizen tools & techniques, but there is no practical involvement of university students in real time implementation of Kaizen in different organizations. Students do not have access to these organizations to get accurate data and they face difficulties in getting accurate data for empirical research.

b. Kaizen is a CI process and need consistency in policies and support to Kaizen activities from management of the organization, whereas in public sector organizations of Pakistan, policies change continuously with change of command or top management of the organization. Policies of the organizations do not sustain for a longer period. Policies are linked with liking and disliking of the top management running these organizations. Accurate data is neither maintained nor analyzed to identify the causes of poor / unsatisfactory performance and the same is not available to researchers for correct analysis.

c. Organizations also hesitate to give real time and accurate information / data to the researchers because either organizations do not maintain accurate data regarding their organization or they do not want to share the real picture about the performance of their organization. Due to unavailability of accurate data, there are always chances of error in the results obtained through analysis of data / feedback provided by the respondents of the organizations.

Due to the above mentioned reasons, it is very difficult for researchers to carry out research in this field. The researcher had to depend upon observational field study in these organizations. In this research, a framework for effective implementation of Kaizen in automobile sector organizations was formulated on the basis of relationship among independent and dependent variables. The newly developed framework can be generally applied to all automobile sector organizations of Pakistan for improvement for their performance through Kaizen.

5.15.1 Discussion on Effect of IV Such as TMC, OKC, PI, RR, TOW and KETD on HRD through Kaizen Implementation

The first criterion variable selected for discussion in this research is human resource development which is the part of social system outcome of an effective implementation of Kaizen in an organization. The hypothesis formulated says that the "human resource development" through Kaizen implementation in an organization is effected by independent variables of Kaizen, i.e. top management commitment, organizational Kaizen culture, personal initiative of employees, training of workers and Kaizen event & team design.

The results of this research study describe the relationship among selected independent variables and outcome variables of effective Kaizen implementation. The Pearson correlation coefficient values indicate that human resource development has a strong direct relationship with each predictor variable of Kaizen. Based on the results of Pearson correlation coefficient values, the hypotheses H1a, H1f, H1k, H1u and H1z were accepted and null hypotheses were rejected.

The multiple regression model developed for "human resource development" indicates that the top management commitment to Kaizen implementation, organizational Kaizen culture to promote Kaizen activities in the organizations, rewards and recognition given to the internal customers on their achievement through Kaizen and training given to shop floor workers on Kaizen tools and techniques contribute significantly in human resource development of the organizations through Kaizen. On the other hand predictor variable such as Kaizen event and team design and personal initiative of employees do not contribute significantly in human resource development of the organizations through Kaizen activities. On the basis of the results of regression model developed for "human resource development", hypothesis H3 is partially accepted.

The results of this research regarding development of regression model for HRD are in line with research carried out by (Glover, Farris, Van Aken, & Doolen, 2011). Similarly Harman, Golhar & Deshpande (2002), are of the opinion that management plays a vital role in human resource development of the organization. Li (2011) has discussed the role of management support in Chinese quality circle effectiveness. The researcher has proved that the management support has a significant role in effectiveness of Chinese quality circle. Doolen et al., (2008) in his research "critical success factors for sustaining Kaizen event outcome" has discussed the positive role of management in Kaizen event completion and its sustainability in an organization which further develops the human resource of the organizations through improvement in their knowledge skill level and attitude. The best suitable model of human resource development through Kaizen is shown in Figure 5.51.

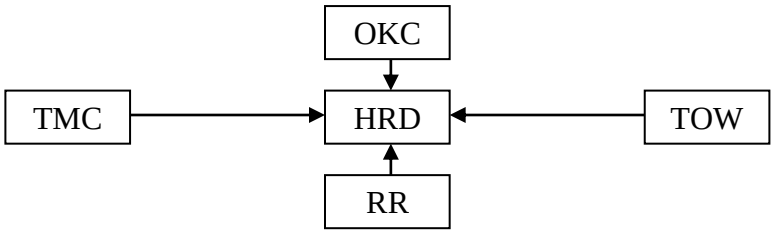

Figure 5.51: Kaizen Frameworks for HRD

5.15.2 Discussions on Effect of IV Such as TMC, OKC, PI, RR, TOW and KETD on WAI through Kaizen

The alternate hypothesis H3b formulated for this research study says that the work area improvement of an organization through Kaizen activities is affected by independent variables of Kaizen such as top management commitment to Kaizen, organization Kaizen culture, personal initiative of employees of the organization, training of workers, rewards and recognition given to employees on their achievement through Kaizen and Kaizen event & team design. Whereas hypotheses H1b, H1g, H1L, H1q, H1v and H1aa indicates the direct relationships of each above mentioned independent variables with work area improvement of an organization through Kaizen.

The hypothesis H3b was partially accepted as a result of the model developed through multiple regression analysis. The result indicates that this outcome variable of Kaizen is

significantly affected by supportive Kaizen culture of continuous improvement, rewards and recognition given to the employees and training of workers on Kaizen tools and techniques. The independent variables such as top management commitment, personal initiative and Kaizen event and team design have no significant contribution in regression model developed for work area improvement. Pearson correlation values indicate the strong direct relationship of independent variables such as training of workers, rewards and recognition given to the employees of the organization and top management commitment to Kaizen with work area improvement; whereas, independent variables such as organization Kaizen culture, personal initiative taken by the employees and Kaizen event & team design have medium type of direct relationship with work area improvement of an organization through Kaizen activities.

The results of this research indicate that work area of those organizations is improved through Kaizen implementation where there is supportive Kaizen culture and achievement of employees of the organization are rewarded and recognized by the management and where suitable training on Kaizen tools and techniques is given to the employees of the organization. The supportive Kaizen culture motivates the employees to participate in Kaizen activities related to work area improvement. Their interest in Kaizen activities will increase when they will be given accurate training on Kaizen tools & techniques. Rewards and recognition given to the employees will motivate the workers to participate in Kaizen activities related to work area improvement in an organization.

These results are supported by the literature and are inconsistent with findings of (Farris, 2006). Meyer and Stott (1985), in their research proved that due to effective implementation of QCC in an organization, work area of the organization can be improved significantly. If the employees are given suitable training, they will be able to diagnose problem areas and solve these problems using organization internal resources. The result of this research indicates that top management commitment has no significant effect on work area improvement and organizational internal process improvement through Kaizen activities because these two variables need commitment and personal interest of employees of the organization. Schematically results of the research are shown in Figure 5.52.

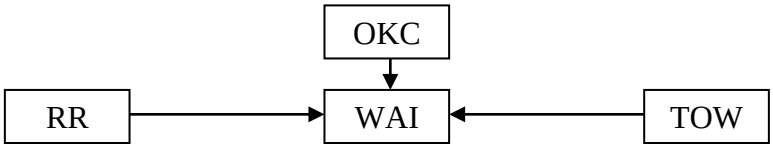

Figure 5.52: Kaizen Frameworks for WAI

5.15.3 Discussions on Effects of IV Such as TMC, OKC, PI, RR, TOW and KETD on PQI through Kaizen

The finding of the research shows that hypothesis H3c is partially accepted as indicated by the regression models developed for "product quality improvement". The model shows that product quality improvement is significantly affected by top management commitment to Kaizen, organization Kaizen culture and training of workers of the organization. These three independent variables have strong direct relationship with "product quality improvement" accepting hypotheses H1d, H1j, and H1x. The direct relationship of other three independent variables such as rewards and recognition, personal initiative of employees of the organizations and Kaizen event & team design is also highly significant with product quality improvement. However, multiple regression models developed for PQI shows that the effects of three independent variables such as PI, KETD, and RR on product quality improvement through Kaizen activities are not significant.

The result indicates that product / services quality provided to customers will improve a lot in automobile sector organizations when their top management supports the Kaizen activities and promotes the culture of Kaizen in their organization along with training of workers on Kaizen tools & techniques. Whenever top management appreciates the workers and facilitates them in the Kaizen activities, their interest towards continuous improvement in product quality of the organization naturally increases. Furthermore, when the employees are given proper training on Kaizen tools and techniques to solve the problems related to quality of the product, then quality of the product will enhance and wastage rate of the finished product will be reduced. Waste or Mudda from process can be identified and eliminated by the employees of the organization through Kaizen activities.

The results of multiple regression analysis indicate that the "product quality improvement" is not significantly affected by personal initiative of the employees, Kaizen event and team design and rewards & recognition given to workers. Most of the respondents of this

questionnaire were from management and supervisory staff, whereas Kaizen initiatives are taken by the shop floor workers. Furthermore little rewards and recognition given to shop floor workers makes happier to lower staff, it does not have bigger effect on management of the organization. Therefore, the effect of personal initiative and Kaizen event and team design are not significant on PQI, rather PQI depends on individual's skill level, improved processes and tools & techniques being used in the organization. Therefore, the result of the research seems to be considerably logical and correct. The result also points out that the management and shop floor workers should concentrate highly on the objectives of the organization while selecting Kaizen event and Kaizen team members. It is better to select shop floor workers as Kaizen team members who really understand their job and can solve the problem suggested by the employees.

Overall result indicates that the product quality will be improved a lot when top management of the organization support the Kaizen activities to create a Kaizen culture in the organization and facilitates Kaizen team members through provisioning of not only resources but also train the workers on Kaizen tools and techniques to solve the selected problems as Kaizen event. Schematically results of the regression models are shown in Figure 5.53.

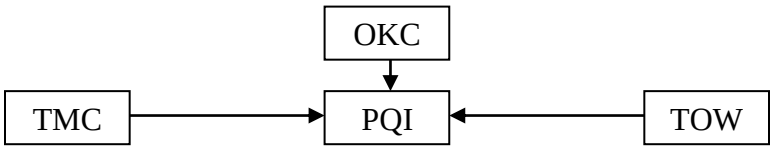

Figure 5.53: Kaizen Frameworks for PQI

5.15.4 Discussions on Effects of IVs Such as TMC, OKC, PI, RR, TOW and KETD on OIPI through Kaizen

Hypothesis formulated for this research study suggests that the organizational internal process improvement as result of effective implementation of Kaizen is affected by independent variables, such as top management commitment to Kaizen, organization Kaizen culture, personal initiative taken by the internal customers of the organizations, training of shop floor workers, rewards and recognition given to shop floor workers on their achievements through Kaizen and Kaizen event & team design.

Model developed through regression analysis shows that this hypothesis is partially accepted. The organizational internal process improvement depends upon Kaizen event & team design, rewards and recognition given to the workers on their achievement through Kaizen,

training of workers on Kaizen tools and techniques and personal initiative taken by the shop floor workers. The role of top management commitment in organization internal process improvement is not significant enough. On the other hand, organizational internal process improvement has a strong and direct relationship with each independent variable, such as TMC to Kaizen, PI taken by the employees of the organization, KETD, RR given to the workers and TOW on Kaizen tools and techniques and medium type direct relationship with Kaizen culture of the organization.

The results indicate that organizational internal processes are improved due to effective implementation of Kaizen only in those organizations where employees of the organization take personal initiative and where workers are trained on different Kaizen tools & techniques. The shop floor worker efforts to improve the organizational internal processes are properly recognized and rewarded by the top management of the organization. Similarly, selection of Kaizen event and team design also plays a vital role in the improvement of organizational internal processes. Although the regression model shows that the top management commitment and organization Kaizen culture do not have a significant impact on organizational internal process improvement. The Pearson correlation test results indicate that independent variable top management commitment has a strong and direct relationship with organizational internal process improvement. The role of top management is to award rewards and recognition to the employees of the organization and to enhance the level of personal initiative of employees, which further affects "organizational internal processes improvement" cannot be undermined.

The organizational Kaizen culture has medium type direct relationship with organization internal process improvement; however, it has a significant effect on organization internal process improvement in these organizations as indicated by multiple regression model developed in this research and is given in Figure 5.54.

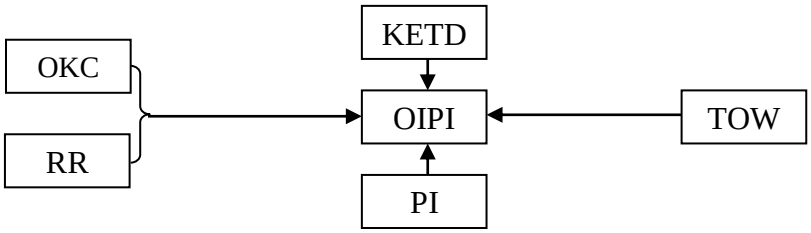

Figure 5.54: Kaizen Frameworks for OIPI

The results of the research are in line with the results of research carried out by Garcia-Sabater et al., (2012); Rich & Bateman, (2003). The result of the this research indicates that the maximum contribution in the organizational internal process improvement model is that of training given to the shop floor workers on Kaizen tools and techniques and subsequently, personal initiative taken by the employees has the second highest value.

5.15.5 Discussions on Effects of IV Such as TMC, OKC, PI, RR, TOW and KETD on OSK

Hypothesis H7 formulated for this research study suggests that the overall success of Kaizen in an organization is affected by independent variables of Kaizen, such as top management commitment to Kaizen, organizational Kaizen culture, personal initiative taken by the shop floor workers, training of worker on Kaizen tools and techniques, rewards and recognition given to employees of the organization on their achievement through Kaizen and Kaizen event & team design. Similarly, hypotheses H1e, H1j, H1o, H1t, H1y and H1dd proposed the direct relationship of each independent variable given above with overall success of Kaizen in an organization. Hypothesis H7 is partially accepted through development of multiple regression models for overall success of Kaizen in an organization. The results of this research indicate that Kaizen is successful in those organizations where top management is committed to implement Kaizen in their organization, employees of the organization take personal initiative to improve the process, workers are trained on Kaizen tools and techniques and their efforts to make Kaizen successful in the organization are properly recognized and rewarded by the top management of the organization. However, the independent variable, "Kaizen event and team design" and "organizational Kaizen culture" do not have significant impact on overall success of Kaizen in an organization.

The result of Pearson correlation test indicates a strong direct relationship of top management commitment, personal initiative of employees, training of workers and Kaizen event & team design. The relationship of overall success of Kaizen in an organization with organizational Kaizen culture is of medium type. Pearson correlation test results indicate the top management commitment to Kaizen has a strong relationship with overall success of Kaizen, as the role of top management in giving rewards and recognition to the employees of the organization and to enhance the personal initiative taken by the employees to improve the level of overall success of Kaizen in the organization is significant. The Beta coefficient values of

regression model indicate that the maximum contribution in the regression models of overall success of Kaizen is that of training given to the shop floor workers on Kaizen tools & techniques and subsequently, personal initiative taken by the employees has second highest value in the regression model.

The results of regression model developed for overall success of Kaizen in an organizations are in line with research study carried out by C. Li, (2011). Schematic view of the results showing correlation of independent variables with OSK is shown in Figure 5.55.

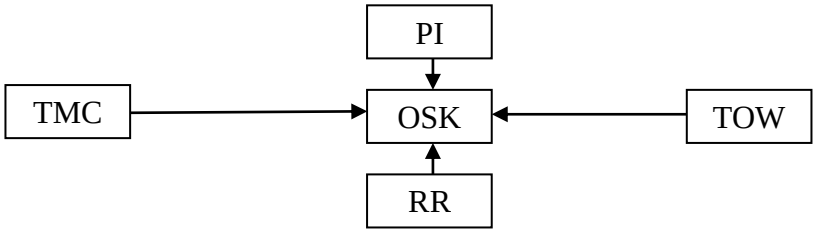

Figure 5.55: Kaizen Frameworks for OSK

5.15.6 **Discussions on Mediation effect of PV between IVs and OSK**

Hypothesis H5 describes that process variables of Kaizen partially mediate the relationship between the predictor variables and overall success of Kaizen in an organization. This hypothesis is partially accepted through the results of mediation analyses. Results of Pearson correlation test indicate a strong direct relationship of all predictor's variables except Kaizen event and team design which has medium type direct relationship with overall success of Kaizen. This confirming "Path C" shown in the Figure 5.40 is significant. The strength of this relationship as identified through regression model developed before checking of mediation effect of process variables was given in the form of standardized beta coefficient values as $\beta 1$=0.226 for TMC, $\beta 2$=0.015 for OKC, $\beta 3$=0.211 for PI , $\beta 4$=0.212 for RR, $\beta 5$=0.364 for TOW and $\beta 6$= 0.092 for KETD. The β coefficient values shows that the independent variable OKC and KETD are non-significant due to low correlation coefficient values in regression model. These two factors were dropped from further mediation analysis process.

The results of multiple regression analysis by incorporating process variable as a criterion variable, have significant relationship confirming path "a" given in Figure 5.40. The strength of relationship between predictor variables and process variable (Path 'a') is given by standardized β coefficient values as (β1=0.563, $\beta 2$=0.414, $\beta 3$=0.461, $\beta 4$=0.476, $\beta 5$=0.396).

The mediator has a significant direct relationship with overall success of Kaizen. The strength of this relationship (Path 'b') is given as beta coefficient value β1=0.889. By incorporating process variables as a mediator between predictor variables and OSK, the strength of existing significant relationship between predictor variables and overall success of Kaizen (Path 'c') has become non-significant, showing that process variable act as a partial mediator between predictors variables and OSK. The reduced values of standardized beta coefficient are given as (*β1*=0.167, *β2*=- 0.017, *β3*=0.200, *β4*=0.190, *β5*=0.324 and *β6*=0-085). These results support the research carried out by Farris et al, (2006).

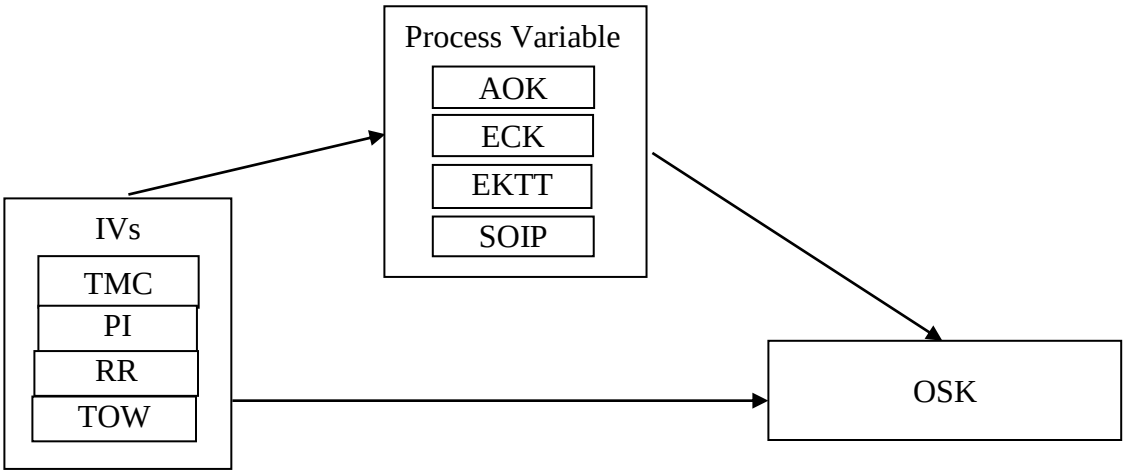

Figure 5.56: PVs Partially Mediate Relationship between IV & Overall Success of Kaizen

5.15.7 **Development of a Final Framework**

Keeping in view the results of this research study and by considering all the factors discussed above, the final framework developed for effective implementation of Kaizen in automobile sector organizations of Pakistan is shown in Figure 5.57 below.

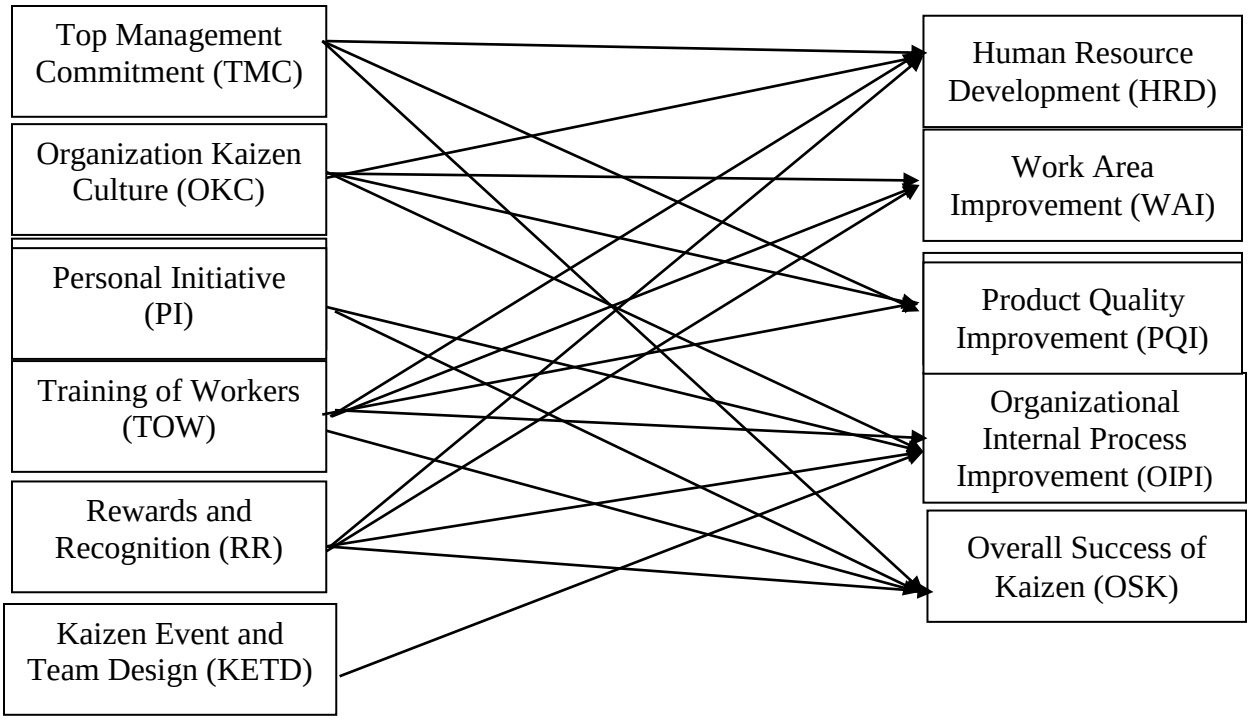

Figure 5.57: Final Framework for effective implementation of Kaizen

5.16 **Validation of Research Framework**

The framework developed through this research was validated through two different ways. Initially, the results were compared with similar research studies available in the literature related to effective implementation of TQM, Quality Circle, JIT and other CI tools and techniques for the performance enhancement of the organizations. Secondly, the results of one of the regression models related to organizational internal process improvement through Kaizen were implemented in an automobile workshop. With effective implementation of newly developed research models encouraging results were achieved. The automobile workshop improved its revenue up to 13% (Saleem et al., 2014) through achieving customer satisfaction by improvement in its internal processes within six months of the implementation of newly developed research framework.

The results of this research were compared with the results of research carried out by Farris, (2006); Berger, (1997). The authors have studied CI & Kaizen, effect of standardization of organizational process and organizational design on CI and factors related to Kaizen team and Kaizen event design. The result of the research carried out by these researchers are in line with the results achieved through this study. Moosa (2009), in his research study has proved the

positive role of organizational head in effective implementation of TQM in an organization. The author is of the opinion that head of the organization or head of quality assurance program has a significant role in effective implementation of TQM.

In a similar study Qureshi, Iftikhar, Bhatti, Shams, and Zaman (2013) have carried out research on effects of critical elements like product design, total quality control, inventory management, supply chain management and production plane on implementation of philosophy of JIT in cement industries of Pakistan. The researchers have proved that the above mentioned elements have positive correlation with effective implementation of JIT in cement industries. This study emphasizes the need for top management commitment to incorporate changes in the organizations to implement JIT philosophy in the cement factories of Pakistan. Since the study carried out by Qureshi et al., (2013) was done in similar environment and similar culture of Pakistan as in this research study, therefore a similar kind of relationship appeared in both research studies.

Glover et al. (2011) in their research titled "critical success factors for human resource outcomes in Kaizen events" have discussed human resource development in the form of improvement in skill level, attitude and knowledge related to problem solving of participant of Kaizen events and overall impact of Kaizen event on work area of the organizations. The authors have analyzed that input factors such as Kaizen goal clarity, Kaizen goal difficulty, Kaizen team autonomy, Kaizen team experiences, Kaizen team homogeneity, Kaizen team functional homogeneity Kaizen team leader experience, Kaizen event planning process, and management supports have positive effects on Kaizen outcomes such as human resource development and work area improvement of the organizations.

Research carried out by J. Li (2011), highlights effects of input factors such as goal clarity, goal difficulty, management supports and team experience on attitude, skill and understanding level of employees of the organization related to continuous improvement through effective implementation of Quality Circle in in Chinese organizations. The results of this research study are in line with the research carried out by (J. Li, 2011). The author has proved that in Chinese organizations, goal clarity and goal difficulty have positive impact on attitude of the employees of the organizations. Similarly, motivational level and skill of the employees is

affected by goal clarity only, whereas employees understanding level of continuous improvement is affected by both goal clarity and management support

Brunet and New (2003), in their research study "Kaizen in Japan: an empirical study" highlighted three aspects such as nature of Kaizen, purpose of Kaizen and how is Kaizen implemented in a specific organization. The author has proved through a case study that human resource can be developed through Kaizen. He was of the opinion that major outcome of Kaizen is to create a mind-set in which radical changes and new technologies become more easily accepted on the shop floor. The researcher is of the opinion that human resource development through Kaizen is affected by different organizational, social and technical factors. Organizational culture, formulation of team for work and satisfaction level of workers play a vital role in human resource development through Kaizen.

5.17 **Summary**

The findings of the research and discussions on results of research work were highlighted in this chapter. First of all, demography of respondent organizations were thoroughly discussed. Aggregation of individual level response to an organization level response has been carried out through ANOVA calculations and Interaclass correlation coefficient value. The descriptive statistics has been explained in this chapter. The bivariate correlation between independent and dependent variables as well as between process and dependent variables has been determined to test the hypotheses from H1a to H1dd & H2a to H2t. The value of Pearson correlation coefficient indicates the strength of relationship between independent and dependent variables. Standard linear multiple regression and hierarchical multiple regression analysis were performed to test the hypotheses from H3 to H5. To make the results of regression analyses more accurate, five basic assumptions of regression analyses were confirmed before performing regression analyses. Linear regression model for all dependent variables, e.g. human resource development, work area improvement, internal process improvement, product quality improvement and overall success of Kaizen were developed through multiple regression analyses. Finally, mediation effect of process variable between each independent variable and overall success of Kaizen was checked through hierarchical regression analysis. The results are discussed in detail / thoroughly in the last section of this chapter.

CHAPTER 6: FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter starts with the overview of the research study, revisits the purpose and objectives of the research. Section 6.3 deals with the summary of significant findings of the research and discussions on these findings. The detailed interpretation of the research results has been done in this section. Discussions on initially observed relationship between outcome variables and independent variables of Kaizen to answer the research questions and pre-requisite for development of regression model for each outcome variable of Kaizen has been made. The findings of the research study regarding identification of different factors in the form of independent and dependent variables of Kaizen, relationship between dependent variables and different independent variables of Kaizen have been presented. Mediation effect of process variables, between predictors (independent variables) and overall success of kaizen has been discussed in this section. Limitation or scope of the research has been defined in section 6.4 of this chapter. The section 6.5 highlight contribution of the research study. Implications of the research study have been presented keeping in view its relevance to theoretical implication and practical implication in this section. Conclusion of the research study has been made in section 6.6. At the end of the chapter, different suggestions / recommendations regarding future research work relevant to effective Kaizen implementation have been given in section 6.7.

6.2 Overview of the Research Study

In this research study, different factors in the form of independent variables affecting Kaizen practices in Pakistani automobile sector's organizations and outcome variables of kaizen were identified. Empirical analysis of the relationship among different independent and dependent variables of Kaizen has been carried out. Different independent and dependent variables related to Kaizen implementation were identified through literature review given in chapter 2. The survey questionnaire was designed and tested through a pilot study before dispatching the survey questionnaire to large numbers of respondents' organizations. Survey items were validated through factors analysis and reliability test was carried out through finding of Cronbach's alpha values. In order to enhance the authenticity and generalizability of the research results, the sample size was enhanced through selecting more than one respondents from each respondent organization. Out of 455 survey questionnaires forwarded to 216 different

organizations, 200 survey responses covering all the parts of questionnaire from 61 different organizations were finally received showing an overall response rate of 31.35%. During face validation and data screening, out of 200 responses received, 27 were rejected and 173 survey responses were finally used for statistical analysis. Before statistical analysis of the data using SPSS tools, consistency and reliability of different survey scale items were confirmed through exploratory as well as confirmatory factor analysis of survey scale items.

The first research question that was to establish a well-known definition of Kaizen and identification of different factors affecting Kaizen implementation in the form of independent and dependent variables of Kaizen were confirmed through literature review. Statistical tools such as Pearson correlation test, ANOVA, multiple linear regression analysis were used to test the hypotheses and to identify the relationship between different factors affecting Kaizen implementation and its outcome in automobile sector organizations of Pakistan. To enhance the scope of this research, mediation analysis of PV has also been performed between predictors or IV of Kaizen and criterion variables OSK in an organization.

6.3 Summary of Significant Findings of the Research Study

A few significant findings of this research are explained as following:

a. The independent variable of Kaizen such as "top management commitment" has significant direct relationship with outcome variables of effective implementation of Kaizen such as human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in Pakistani automobile sector organizations.

b. The independent variable of Kaizen such as "organizational Kaizen culture" has a significant direct relationship with outcome variables of effective implementation of Kaizen, such as human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in automobile sector organizations of Pakistan.

c. The independent variable of Kaizen such as "personal initiative" has a significant direct relationship with outcome variables of effective implementation of Kaizen such as human resource development, work area improvement, organization

internal process improvement, product quality improvement and overall success of Kaizen in an organization.

d. The independent variable of Kaizen such as “rewards and recognition” has significant direct relationship with outcome variables of effective implementation of Kaizen such as human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in an organization.

e. The independent variable of Kaizen such as “training of workers” has significant direct relationship with outcome variables of effective implementation of Kaizen such as human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen in an organization.

f. The independent variable of Kaizen such as “Kaizen event and team design” has significant direct relationship with outcome variables of Kaizen, such as human resource development, work area improvement, organization internal process improvement, product quality improvement and overall success of Kaizen.

g. The outcome variable of Kaizen implementation, such as “human resource development”, is affected by top management commitment, organization Kaizen culture, rewards & recognition and training of workers in automobile sector organizations of Pakistan.

h. The outcome variable of effective implementation of Kaizen in an organization, such as “work area improvement”, is affected by organization Kaizen culture, rewards and recognition and training of workers.

i. Outcome variable of effective implementation of Kaizen in an organization, such as “product quality improvement”, is affected by top management commitment, organization of Kaizen culture and training of workers.

j. The outcome variable of effective implementation of Kaizen in an organization, such as “organization internal process improvement”, is affected by rewards and

recognition, training of workers, personal initiative and Kaizen event and team design.

k. The outcome variable of effective implementation of Kaizen in an organization, such as "overall success of Kaizen", is affected by top management commitment, rewards & recognition, training of workers and personal initiative of employees of the organization.

l. The process variable such as employee's commitment to Kaizen, partially mediate the relationship between independent variables of Kaizen and overall success of Kaizen in an organization.

6.4 Limitations of Study

The summary of limitations of the research study was presented in section 1.7. Detail limitations associated with this research are explained as follows:-

a. Since in Pakistan, Kaizen is being implemented mostly in automobile sector organization. Therefore, in this research, automobile organizations located in different parts of Pakistan were selected for survey. Another limitation observed by the researcher is lack of cooperation and response from the respondent's organizations. The organizations from developing countries like Pakistan hesitate to share requisite information needed for the research and do not cooperate fully with researchers. This may lead to limited number of respondents. The results of this research can be generalized for different type of organizations by increasing the sample size and including a variety of organizations in the survey.

b. In certain cases, organizations do not allow the researchers to get information directly from respondents. Secondly, whenever perceptions of individuals regarding survey scale items from an organization is sought out, there is always a chance of receiving a bias response which cannot be eliminated completely. Some respondents might have taken the survey more seriously than others and their response is more accurate as compared to other respondents in the same organization. So, there were chances of variations in the results obtained from data gathered through survey of different organizations. Therefore, in this

research, data was collected from more than one individual from each organization and results were obtained based on data aggregated at organization level taking average of all respondents from the same organization.

c. The results were based upon feedback given by the respondents from the selected organizations. Although, it was ensured during survey that feedback from management, supervisors and shop floor workers having different service experience and working at different level, was gathered to minimizing the effect of biasness, even then there are chances of measuring the biased perception of individual respondents regarding overall success of Kaizen in these organizations.

d. The results of empirical analysis were obtained using backward selection and enter methods. However, there are always chances that the best model may not be the final model selected, because in exploratory study there is always some risk in result of the regression analysis. Almost 20% to 35% variation in outcome variables of different regression models remained unexplained in regression models which cover a substantial effect on the result of the research. However, even in social science research involving regression analysis, the model explains 60% to 70% variation in outcome variable due to change in independent variables.

6.5 **Contribution of Research Study**

The specific or unique contribution of this research has been given in section 1.10 of chapter 1 of this research study. There are several theoretical as well as practical implications of this research work. Practical implementation of research framework of Kaizen in an organization will ensure CI in performance of the organization. The results of this research will contribute to increase the existing knowledge on Kaizen. This research will answer many questions related to CI of the performance of the organization using organization own resources. Different new factors affecting Kaizen implementation in an organization were identified. It also relates these factors to the existing theories and model related to Kaizen implementation. The contributions made through this research can be broadly divided into two different categories, theoretical contributions and practical implications.

6.5.1 **Theoretical Contribution**

There is very limited empirical research found in the literature on identification of relationship between different independent variables affecting Kaizen and its outcome in an organization. This research has investigated impact of different IVs, such as OKC, TMC, PI, RR, TOW and KETD on outcome variables of effective implementation of Kaizen in the form of HRD, WAI, PQI, OIPI and OSK in an organization. Framework developed through this research is based on data collected from Pakistani organizations and will enhance the knowledge and theory of Kaizen regarding effective implementation of Kaizen in automobile sector of Pakistan. In this research, efforts have been made to measure real time perceptions of individual respondents from automobile sector organizations of developing countries like Pakistan instead of getting data from data bank available on internet.

Previously, research regarding implementation of Kaizen in private sector organizations has been done mostly in the form of case studies focusing on an individual organizations and behavior of its employees, which is not sufficient to broadly understand the bigger picture related to implementation of Kaizen in the organizations. However, unlike previous researches, this research utilizes empirical analysis to identify the relationship between six independents and five outcome variables of Kaizen. The results obtained through empirical research are more valid and reliable than case studies. Different regression models developed through this research confirm the theory / models related to Kaizen and add valuable insights in theory of knowledge related to Kaizen.

6.5.2 **Practical Contribution**

The automobile sectors organizations and their subsidiaries in Pakistan and many other developing countries of the world outside Japan are looking for an effective and implementable framework of Kaizen to enhance their performance, human resource development, work area improvement, product quality improvement and their internal processes improvement. Development of a framework through this research will be a valuable contribution for the organizations to implement Kaizen effectively and to improve their performance. Kaizen implementation framework is practicable and can be implemented in the organizations without much expenditure. According to the newly developed research framework for effective implement of Kaizen in an organization, the top management of organization has to show its

commitment to Kaizen and facilitate the Kaizen team members to complete different Kaizen events selected in their organization.

The result of the research indicate that Kaizen will be more fruitful in those organizations where top management creates Kaizen culture in the organization, employees of the organization show personal initiative in Kaizen activities and their achievement through Kaizen are rewarded and acknowledged by the management of the organization. In this model, organizations plan training of their workers to enhance the skill level, knowledge and attitude of their shop floor workers about Kaizen tools and techniques.

6.6 **Conclusions**

In today's competitive environment, automobile sector organizations have to adopt effective ways and means to increase their performance and remain competitive in the business market. Kaizen is a philosophy of continuous improvement in performance, process and quality of the product without much expenditure. Kaizen involves organizations internal customers to select and complete minor improvement projects known as Kaizen events. The effect of these small improvement projects are accumulated to result in overall increase in performance of the organizations. These small projects include different types of activities in different fields of the organization such as WAI, organization layout improvement, PQI, OIPI and of course HRD through enhancing skill level knowledge and Kaizen attitude of the shop floor workers.

Organizations can improve their performance by implementing Kaizen philosophy without going into innovation in technology or bringing a major change in infrastructure of the organization. This is only possible through effective implementation of Kaizen in the organization. The results of the research have identified the relationship between important independent and dependent variables of Kaizen. The strength of the relationship between each independent variable of Kaizen and outcome variable of Kaizen was identified through value of correlation coefficient or beta coefficient calculated through multiple regression analysis. The results of the research clearly identified that outcome variables of Kaizen such as HRD, WAI, OIPI, PQI and OSK depends on commitment from top management of organizations, existence of Kaizen culture in the organization, appreciation given to the individual employees of the organization on taking personal initiative to select and solve the problem through Kaizen using organization own resources and shop floor workers.

The rewards and recognition given to employees on their achievement through Kaizen and training provided to the workers on Kaizen tools & techniques play a vital role in effective implementation of Kaizen in an organization. The process variables partially mediate the relationship between selected independent variables and overall success of Kaizen in an organization. On the basis of findings of this research framework, effective implementation of Kaizen in automobile sector organization would be possible and organizations can improve their performance continuously.

6.7 Recommendations for Future Research

There is always room for improvement in every field of research. Therefore, results of this research can be made more useful by providing solutions of limitations of this research in future research work. Following is recommended in this regards:-

a. In order to generalize the finding of the research, a large numbers of respondents from a variety of organizations of the world can be included in survey so that results can be wider in scope.

b. Based on the result of this research study and study made by (Farris, 2006), there is possibility of applying quasi-experimentation for each outcome variable by narrowing down the hypothesized relationship to parsimonious sets for further testing through future research work.

c. Empirical analysis of any additional parameters / variables related to effective implementation of Kaizen can be made in future research work to make this framework more effective and applicable to all sectors of industries.

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Annexures

Letter to Organizations **Annexure A**

Department of Engineering Management (NUST) College of E&ME Rawalpindi

Kaizen (Continuous Improvement) Implementation Survey- 2013

Dear Participant,
Assalam O Alaikum

I, Mr. Muhammad Saleem am a PhD research scholar in Engineering Management Department at NUST College of Electrical &Mechanical Engineering Rawalpindi.

This survey questionnaire is part of a research study sponsored by the National University of Sciences and Technology (NUST) Islamabad. The research focus on finding the major factors associated with effective implementation of Kaizen and strength of correlation among these factors. Your organization is one of the few organizations chosen for the research study and will get firsthand information about the research. You will be able to use the findings to design better methods for Kaizen implementation. In this questionnaire information regarding implementation of Kaizen, for continuous improvement of processes, quality and productivity of your organization has been asked for. This study focus on to get status of Kaizen implementation in your organization and opinion of following members related to relationship among different factors associated with Kaizen implantation.

a. CEO/GM/MD
b. Production Manager
c. Quality Managers
d. Kaizen Facilitator
e. Kaizen Team Leaders/ Team Members

It will take few moments out of your busy schedule to complete the questionnaire. Your contribution by filling this questionnaire will be highly appreciated. Information provided by you will only be used for academic research purpose. If you are having any difficulty in preparing reply of any questions, please Contact

Muhammad Saleem at:ranasaleem096@yahoo.com**OR Cell No: 03345292503**

Please click the following link to fill the survey questionnaire.

⇔ **Fill the survey questionnaire now**

Thank you for your participation. If you have any question or comments, please contact,

Muhammad Saleem,
PhD Scholar

Department of Engineering Management,

NUST College of E&ME Rawalpindi

Survey Questionnaire (PART-I)

General Information Related to Organization (Please tick (√) the appropriate block)

1. **Your position/designation in the organization?**

   □ General Manager □ Quality Manager □ Supervisor/ Kaizen Facilitator

   □ Kaizen Team Leader □ Kaizen Team Member

2. **Your experience in present organization?**

   □ Up to 5years □ 5-10 years □ 11-15 years □ 16-20years

3. **Number of employees in your organization?**

   □ Less than 50 □ 50 -100 □101 -200 □ 201-250 □ More than 250

4. **Location of your organization?**

   □ Islamabad □ Punjab □ Sindh □ Baluchistan □ Khyber Pukhtoon Khawa

5. **Classification of your product?**

   □ Car, Pick Up& Vans □ Trucks/Bus □ Motor Cycles □ Tractors

   □ Rickshaw □ Automobile Parts Manufacturers □ Parts & Service Providers

6. **Is Human Resource Development, an organized function in your organization?**

   □ Yes □ No

7. **What is the quality of human resources function in your organization?**

   □ Good □ Satisfactory □ Weak

8. **Does Established Kaizen culture exist in your organization?**

   □ Yes □ Partially □ No

9. **What is competency level of employees of your organizations on following?**

Designation of Employees	Technical Competency			Quality Management Skills			Commitment Towards Kaizen		
	Good	Satisfactory	Weak	Good	Satisfactory	Weak	Good	Satisfactory	Weak
Manager									
Supervisors									
Workers									

10. **What is implementation status and awareness level of following quality tools in your organization?**

Types of Tools	Awareness Level			Implementation Level		
	Good	Satisfactory	Weak	Good	Satisfactory	Weak
ISO 9000 QMS						
Quality Circle						
Kaizen						
5S						
Benchmarking						
7 Basic QC Tools						
Customer Surveys						

11. **Please tick the appropriate block. How your organization ensures quality in its products/ services provided to customer?**

□ Separate quality assurance department.

□ Employment of a full time inspector.

□ Inspection by operators/ workers themselves.

□ Proposal system such as Kaizen.

□ Finished goods inspection system

□ Semi finished goods inspection system

□ Introduction of QC Circles.

12. **Please tick the factors you consider essential for successful implementation of Kaizen?**

□ Top management commitment	□ Yes	□ No
□ Standardization of organizational internal process	□ Yes	□ No
□ Personal initiative of employees	□ Yes	□ No
□ Organization Kaizen culture	□ Yes	□ No
□ Action oriented Kaizen	□ Yes	□ No
□ Employees Commitment to Kaizen	□ Yes	□ No
□ Kaizen event & team design	□ Yes	□ No
□ Reward and recognition towards workers	□ Yes	□ No
□ T*raining & education of workers*	□ Yes	□ No
□ Expertise on kaizen tools & techniques	□ Yes	□ No

□ Any other _____

13. **In your opinion the outcome variables of effective implementation of Kaizen include**

□ Work area improvement	□ Yes	□ No
□ Human resource development	□ Yes	□ No
□ Product quality improvement	□ Yes	□ No
□ Organization internal process improvement	□ Yes	□ No
□ Overall success of Kaizen	□ Yes	□ No

□ Any other _____

14. **What is Kaizen implementation status in your organization?**

a. Organized Kaizen program	□ Yes	□ No
b. Partially organized Kaizen function	□ Yes	□ No
c. No organized kaizen function	□ Yes	□ No

If organized or partially organized then go to next page (Part-II).

Survey Questionnaire Part - II

Measure of Perceptions of Respondents Related to Key Variables Affecting Kaizen

Name of your Organization: _____ In your fair judgment, to what extent following statements regarding Kaizen implementation, reflects what your organization has been practicing so far:- 1. **Strongly Disagree**. 2. **Disagree**. 3. **Neutral**. 4. **Agree**. 5. **Strongly Agree**.		**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
		5	**4**	**3**	**2**	**1**
1.	In general, Kaizen activity motivated the team members in your organization.					
2.	In your organization work area has been improved due to Kaizen activities					
3.	100% of units produced/service provided by your organization are accepted by the customers.					
4.	In your organization line workers are encouraged to fix the problems they feel in the process through Kaizen activities.					
5.	Quality of your organization's products has been improved a lot due to Kaizen activities.					
6.	Stakeholders are satisfied with your organization's performance.					
7.	In your organization employees think that kaizen is a good strategy of continuous improvement.					
8.	In your organization employees participating in kaizen activities, spent most of their time in work area.					
9.	In your organization Kaizen team member's ideas about improvement are selected as kaizen event.					
10.	In your organization employees participating in Kaizen activities are expert in use of 7QC tool.					
11.	In your organization standards are continuously improved through Kaizen					
12.	In your organization top management thinks quality is more important than production schedule.					
13.	In your organization employee's participation and discussion in Kaizen activity is open.					
14.	In your organization stability and continuity of order regarding Kaizen exists.					

	Scale Items	5	4	3	2	1
15.	In your organization employees always takes initiative to solve the minor problems during routine works.					
16.	In your organization effective profit sharing program in the form of bonus exist.					
17.	In your organization employees are trained on use of different Kaizen tools & techniques.					
18.	In your organization Kaizen team has enough experience of previous kaizen activities in the organization.					
19.	In your organization Kaizen event planning and design affects the kaizen outcomes.					
20.	Technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.					
21.	Overall achieving Kaizen goals have improved work area efficiency of your organization					
22.	The reliability and durability of your organization's primary product is 100%.					
23.	The customers are satisfied with the performance of your organization's primary product.					
24.	In your organization Kaizen activities have reduced the rejection rate of your product.					
25.	Overall Kaizen activities have achieved their Kaizen goals set by your organization.					
26.	In your organization employees think that holding kaizen activity is good for organizational performance improvement.					
27.	In your organization employees participating in kaizen activities spent very short time in meeting rooms.					
28.	In your organization Kaizen team members have enough experience of kaizen event.					
29.	In your organization employees understanding and awareness level about kaizen affects its outcome.					
30.	In your organization current methods are regularly analyzed for improvement.					
31.	In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of product.					
32.	In your organization employees are empowered to act and communicate results of Kaizen.					
33.	In your organization Kaizen team has ability to overcome barriers.					

	Scale Items	5	4	3	2	1
34.	In your organization Kaizen team members respect each other's opinion & feelings.					
35.	Monthly best worker is declared in each department of your organization.					
36.	In your organization employees do not view new seminar or program on kaizen as "Just another fad.					
37.	In your organization Kaizen team leader is more experienced than other team members.					
38.	Kaizen team members' skill level enhanced after each kaizen event in your organization.					
39.	Lot of place has been made available for work through Kaizen activities in your organization					
40.	In your organization internal processes have been improved a lot due to Kaizen activities.					
41.	In your organization manufactured products/service provided, need no rework.					
42.	Overall Kaizen is perceived as success in your organization.					
43.	Higher customer's satisfaction is being achieved through kaizen implementation in your organization.					
44.	In your organization employees are of opinion that Kaizen will serve an important purpose of organizational performance improvement.					
45.	In your organization employees participating in kaizen activity are fully supported by facilitator.					
46.	In your organization employees have much knowledge & training on Kaizen tools & techniques.					
47.	In your organization internal processes are standardized.					
48.	In your organization standardization of internal process affect the Kaizen outcomes					
49.	In your organization top level management allocates enough resources for Kaizen activities.					
50.	In your organization employee's concerned ideas are access by the management.					
51.	In your organization Kaizen team members have shown initiative in the organization.					
52.	In your organization financial rewards are given to individual employees for excellent suggestion.					

	Scale Items	5	4	3	2	1
53.	In your organization employee's participation in Kaizen activities are being encouraged and awarded by senior.					
54.	Your organization trains employees to improve their interactive skills.					
55.	In your organization Kaizen team members have been given clear goals.					
56.	Team member's interest in Kaizen activities increases after each Kaizen event.					
57.	In your organization work area is neat and clean due to Kaizen implementation.					
58.	Your organizational internal process improved due to Kaizen implementation.					
59.	Your organization's products are in conformance to customer's requirement.					
60.	Benefit/ outcomes of Kaizen are sustainable in your organization.					
61.	In your organization employees are committed to Kaizen activity.					
62.	In your organization employees believe that Kaizen is necessary for continuous improvement of the organization.					
63.	In your organization Kaizen team spends lot of time in discussing ideas before trying them out in the work area.					
64.	In your organization employees have better understanding of Kaizen tool and techniques.					
65.	In your organization proper standards exists for each process improvement through Kaizen					
66.	In your organization top management thinks Kaizen is important for continuous improvement of the organization.					
67.	In your organization, during company level meetings, management discusses importance of Kaizen.					
68.	In your organization creative problem solving processes exists.					
69.	In your organization employees are willing to give suggestions for continuous improvement.					
70.	In your organization employees are motivated through rewards and recognition.					
71.	In your organization resources are made available for training of employees.					
72.	In your organization employees are encouraged to acquire project management skills to meet deadlines.					
73.	Kaizen team members cross functionality and autonomy have effect on Kaizen success.					

Thank you for your valuable input. If you have anything else to share regarding your experience about Kaizen please don't hesitate to write down at the back of this paper.

Annexure C

PART –II Urdu Version of Survey Questionnaire

Survey Measure of Perception of Individuals Regarding Different Factors Effecting Kaizen Implementation & its Outcomes in their Organization

	آپ کی آرگنائزیشن کا نام: _____ آپ کے خیال میں آپ کی آرگنائزیشن میں Kaizen کے لاگو ہونے کے بارے میں دیے گئے سوالات کے بارے میں آپ کی کیا رائے ہے؟ 1-بہت زیادہ متفق نہ ہونا 2-متفق نہ ہونا 3- کوئی رائے نہیں 4-متفق ہونا 5-بہت زیادہ متفق ہونا	1	2	3	4	5
1	آپ کی آرگنائزیشن میں عام طور پر Kaizen کی سرگرمیوں کی وجہ سے لوگوں کی دلچسپی بڑھی ہے؟					
2	آپ کی آرگنائزیشن میں Kaizen پر عمل کرنے سے کام کی جگہ صاف ستھری ہوئی ہے؟					
3	**آپ کی آرگنائزیشن میں Kaizen سرگرمیوں کے عمل دخل سے آرگنائزیشن کے اندرونی کام کرنے کے طریقہ کار میں بہتری آئی ہے؟**					
4	آپ کی آرگنائزیشن میں Kaizen سرگرمی کی وجہ سے بننے والی اشیاء کے Reject کرنے کے تناسب میں کمی آئی ہے؟					
5	Kaizen سرگرمی کی وجہ سے خریدار آپ کی آرگنائزیشن میں بننے والی اشیاء سے مطمئن نظر آتے ہیں؟					
6	آپ کی آرگنائزیشن میں ورکرز یہ سمجھتے ہیں کہ Kaizen آرگنائزیشن کے مقاصد جو کارکردگی میں بہتری لانا ہے، کے حصول میں اہم کردار ادا کرتی ہے؟					
7	آپ کی آرگنائزیشن میں Kaizen سرگرمی میں حصہ لینے والے ورکرز کی سہولت کار پوری طرح سے مدد کرتے ہیں؟					
8	آپ کی آرگنائزیشن میں ورکرز کا Kaizen کے Tools & Techniques کے بارے میں کافی علم ہوتا ہے؟					
9	**آپ کی آرگنائزیشن میں ورکرز کا Kaizen کے بارے میں جاننا اور سمجھنا Kaizen سے حاصل کردہ مقاصد پر اثر انداز ہوتا ہے؟**					
10	آپ کی آرگنائزیشن میں موجود طریقہ کار کا باقاعدگی کے ساتھ بہتری لانے کے لیے جائزہ لیا جاتا ہے؟					
11	آپ کی آرگنائزیشن میں اعلیٰ عہدیدار Kaizen کی سرگرمیوں کے لیے مناسب ذرائع کا بندوبست کرتے ہیں؟					
12	آپ کی آرگنائزیشن میں نئے مسائل کو حل کرنے کا طریقہ کار موجود ہے؟					
13	آپ کی آرگنائزیشن میں ورکرز مسلسل بہتری کے لیے تجاویز دینے پر رضامند ہیں؟					
14	آپ کی آرگنائزیشن میں ورکرز کو انعام اور پہچان دے کر کام کے لیے Motivate کیا جاتا ہے؟					
15	آپ کی آرگنائزیشن میں ورکرز کو Kaizen کے مختلف Tools&Techniques کے استعمال کی تربیت دی جاتی ہے؟					
16	آپ کی آرگنائزیشن میں Kaizen ٹیم ممبرز کو واضح حدف دیے جاتے ہیں؟					
17	**آپ کی آرگنائزیشن میں Kaizen سرگرمی کی باقاعدہ منصوبہ بندی اور طریقہ کار کا طے کرنا Kazien کے نتائج پر اثر انداز ہوتے ہیں؟**					
18	آپ کی آرگنائزیشن میں جو لوگ Kaizen کی سرگرمیوں میں حصہ لیتے ہیں ان کی معلومات باقی لوگوں سے بہتر ہیں؟					
19	آپ کی آرگنائزیشن میں بننے والی تمام اشیاء کو گاہک 100 فیصد قبول کر لیتے ہیں؟					
20	آپ کی آرگنائزیشن میں Kaizen سرگرمیوں کے ذریعے ورکرز کو کام کے طریقہ کار میں موجود مسائل کو حل کرنے کی حوصلہ افزائی کی جاتی ہے؟					

					آپ سمجھتے ہیں کہ آپ کی آرگنائزیشن میں Kaizen کو کامیاب قرار دیا گیا ہے؟	21
					آپ کی آرگنائزیشن میں ملازمین کو Kaizen سرگرمیوں پر عبور حاصل ہے؟	22
					آپ کی آرگنائزیشن میں ورکرز کا یقین کے کہ مسلسل ترقی/بہتری کے لیے Kaizen سرگرمی ضروری ہے؟	23
					آپ کی آرگنائزیشن میں Kaizen ٹیم کسی بھی مسئلہ کو عملی طور پر حل کرنے سے پہلے اس کے بارے میں تفصیلاً بحث پر بہت زیادہ وقت لگاتے ہیں؟	24
					آپ کی آرگنائزیشن میں ورکرز کی Kaizen کے Tools & Techniques کے بارے میں سمجھ بوجھ اچھی ہے؟	25
					آپ کی آرگنائزیشن میں Kaizen کے اندرونی طریقہ کار ایک مقرر معیار کے مطابق ہیں اور وہ Kaizen کے ذریعے بہتری لانے پر اثر انداز ہوتے ہیں؟	26
					آپ کی آرگنائزیشن میں اندرونی طریقہ کار کا مقرر کردہ معیار Kaizen کے نتائج پر اثر انداز ہوتا ہے؟	27
					آپ کی آرگنائزیشن میں میں کمپنی لیول کی میٹنگ میں اعلیٰ عہدیدار Kaizen کی اہمیت پر بحث کرتے ہیں؟	28
					آپ کی آرگنائزیشن میں Kaizen کے تسلسل کو برقرار رکھنے کے احکامات موجود ہیں؟	29
					آپ کی آرگنائزیشن میں ورکرز روزانہ کام میں آنے والے مسائل کو حل کرنے میں بڑھ چڑھ کر حصہ لیتے ہیں؟	30
					آپ کی آرگنائزیشن میں منافع میں ملازمین کو بونس کی شکل میں حصہ دینے کا نظام موجود ہے؟	31
					آپ کی آرگنائزیشن میں ورکرز Kaizen پر معلوماتی ورکشاپ یا سیمینار کو اپنے لیے مصیبت یا بوجھ نہیں سمجھتے ہیں؟	32
					آپ کی آرگنائزیشن میں ملازمین کو مقرر کردہ معیاد میں پروجیکٹ مکمل کرنے کے لیے Project Management کا ہنر سیکھنے پر حوصلہ افزائی کی جاتی ہے؟	33
					Kaizen ٹیم ممبرز کی آزادی متفرق افراد پر مشتمل ہونا Kaizen کی کامیابی پر اثر انداز ہوتا ہے؟	34
					آپ کی آرگنائزیشن میں ہر Kaizen سرگرمی میں حصہ لینے والوں کی مہارت میں اضافہ ہوا ہے؟	35
					آپ کی آرگنائزیشن میں بننے والی یا مہیا کی جانے والی اشیاء/سہولیات 100 فیصد پائیدار اور قابلِ اعتماد ہیں؟	36
					آپ کی آرگنائزیشن میں بننے والی بنیادی اشیاء سے خریدار مطمئن ہیں؟	37
					آپ کی آرگنائزیشن میں Kaizen کے حاصل کردہ فوائد کو برقرار رکھا گیا ہے؟	38
					آپ کی آرگنائزیشن میں ورکرز یہ خیال کرتے ہیں کہ Kaizen ترقی کا اچھا طریقہ کار ہے؟	39
					آپ کی آرگنائزیشن میں Kaizen سرگرمی میں حصہ لینے والے ورکرز میٹنگ میں بہت کم وقت گزارتے ہیں؟	40
					آپ کی آرگنائزیشن میں Kaizen ٹیم ممبرز کا Kaizen سرگرمیوں کے بارے میں کافی تجربہ ہوتا ہے؟	41
					آپ کی آرگنائزیشن میں باقاعدہ معیار موجود ہیں جن کے ذریعے آرگنائزیشن کے اندرونی طریقہ کار میں بہتری آئی ہے؟	42
					آپ کی آرگنائزیشن میں اعلیٰ عہدوں پر فائز لوگ یہ سمجھتے ہیں کہ آرگنائزیشن کی مسلسل بہتری کے لیے Kaizen نہایت اہم ہے؟	43
					آپ کی آرگنائزیشن میں ورکرز کی Kaizen سرگرمی میں حصہ لینے اور بحث کرنے کی کھلی اجازت ہے؟	44
					آپ کی آرگنائزیشن میں Kaizen ٹیم مسائل پر قابو پانے کی اہل ہے؟	45
					آپ کی آرگنائزیشن میں ماہانہ بہترین ورکرز کا اعلان تمام شعبہ جات میں کیا جاتا ہے؟	46

					آپ کی آرگنائزیشن میں ورکرز کو اپنی صلاحیت بہتر بنانے کے لیے تعلیم وتربیت دی جاتی ہے؟	47
					ہر مرتبہ Kaizen کی سرگرمی میں حصہ لینے والے ٹیم ممبرز کی Kaizen میں دلچسپی بڑھی ہے؟	48
					آپ کی آرگنائزیشن میں Kaizen سرگرمی کی وجہ سے آرگنائزیشن کے اندر کام کرنے کے طریقے میں بہتری آئی ہے؟	49
					آپ کی آرگنائزیشن میں بننے والی یادی جانے والی سہولیات/اشیاء پر دوبارہ کام کی ضرورت نہیں پڑتی ہے؟	50
					متعلقہ لوگ آپ کی آرگنائزیشن کی کارکردگی سے مطمئن ہیں؟	51
					آپ کی آرگنائزیشن میں ورکرز یہ خیال کرتے ہیں کہ Kaizen پر عمل پیرا ہو کر کارکردگی میں بہتری لائی جاسکتی ہے؟	52
					آپ کی آرگنائزیشن میں Kazien ٹیم ممبرز کی بہتری کی تجاویز کو بطور Kaizen سرگرمی لیا جاتا ہے؟	53
					آپ کی آرگنائزیشن میں پہلے سے معیار موجود ہیں جن میں Kaizen سے مسلسل بہتری لائی جاتی ہے؟	54
					آپ کی آرگنائزیشن میں اعلیٰ عہدیدار کارکردگی کا جائزہ اندرونی طریقہ کار میں بہتری اور اشیاء کی کوالٹی میں مسلسل اضافے کی بنیاد پر کرتے ہیں؟	55
					آپ کی آرگنائزیشن میں Kaizen ٹیم ممبرز کام کے آغاز میں پہل کرنے میں بڑھ چڑھ کر حصہ لیتے ہیں؟	56
					آپ کی آرگنائزیشن میں Kaizen سرگرمیوں میں حصہ لینے والوں کی احکام بالا کی طرف سے حوصلہ افزائی کی جاتی ہے؟	57
					آپ کی آرگنائزیشن میں Kaizen ٹیم سابقہ Kaizen سرگرمیوں کا کافی تجربہ رکھتی ہے؟	58
					آپ کی آرگنائزیشن میں Kaizen کی سرگرمیوں کی وجہ سے کام کرنے والی جگہ میں بہتری آئی ہے؟	59
					آپ کی آرگنائزیشن میں بننے والی اشیا خریدار کی ضروریات کے عین مطابق ہوتی ہیں؟	60
					آپ کی آرگنائزیشن میں Kaizen سرگرمیوں کی وجہ سے تمام مقرر کردہ مقاصد حاصل کر لیے گئے ہیں؟	61
					آپ کی آرگنائزیشن میں Kaizen سرگرمی میں حصہ لینے والے ورکرز، کام کی جگہ پر زیادہ وقت گزارتے ہیں؟	62
					آپ کی آرگنائزیشن میں Kaizen سرگرمی میں حصہ لینے والے ورکرز 7QC ٹولز کے استعمال میں ماہر ہیں؟	63
					آپ کی آرگنائزیشن میں اعلیٰ عہدیدار یہ سمجھتے ہیں کہ پیداوار کی نسبت معیار زیادہ اہم ہے؟	64
					آپ کی آرگنائزیشن میں ورکرز کو Kazien کے نتائج سے آگاہ کرنے کا اور Kaizen پر عمل کرنے کا اختیار حاصل ہے؟	65
					آپ کی آرگنائزیشن میں Kaizen ٹیم ممبرز ایک دوسرے کی رائے اور جذبات کا احترام کرتے ہیں؟	66
					آپ کی آرگنائزیشن میں ورکرز کی تعلیم وتربیت کے لیے ذرائع مہیا کیے جاتے ہیں؟	67
					آپ کی آرگنائزیشن میں Kaizen ٹیم لیڈر باقی لوگوں سے زیادہ تجربہ کار ہوتا ہے؟	68
					مجموعی طور پر Kaizen مقاصد حاصل کرنے سے کام کرنے کی جگہ بہتر ہوئی ہے؟	69
					آپ کی آرگنائزیشن میں Kaizen سرگرمیوں کی وجہ سے بننے والی اشیاء کی کوالٹی میں بہت بہتری آئی ہے؟	70
					آپ کی آرگنائزیشن میں ورکرز کی تجاویز کو انتظامیہ کے نزدیک اہمیت دی جاتی ہے؟	71
					آپ کی آرگنائزیشن میں بہتر تجاویز دینے پر ورکرز کو انعام دیا جاتا ہے؟	72
					آپ کی آرگنائزیشن میں Kaizen سرگرمیوں کی وجہ سے کام کی جگہ میں بہت زیادہ اضافہ کیا گیا ہے؟	73

Annexure D

Exploratory Factory Analysis of IVs, PVs and DVs Constructs based on Eigen value ≥ 1

Construct Items	Component														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TMC1	**0.817**	-0.067	-0.053	-0.015	0.124	0.067	0.089	0.109	-0.053	-0.012	-0.081	0.015	-0.023	0.050	0.088
TMC2	**0.889**	0.036	-0.039	0.048	0.095	-0.009	0.119	0.001	-0.002	0.031	-0.104	0.013	-0.044	-0.017	0.084
TMC3	**0.879**	0.017	0.097	0.064	0.075	0.040	0.044	0.006	0.002	-0.040	-0.009	0.071	0.095	0.002	0.061
TMC4	**0.878**	0.027	0.119	0.142	-0.030	0.060	-0.008	-0.083	0.036	-0.013	0.026	0.014	0.086	0.014	-0.085
TMC5	**0.850**	0.022	0.125	0.052	-0.091	0.072	-0.039	-0.070	-0.027	0.078	0.056	-0.028	0.123	-0.015	-0.023
OC1	0.047	**0.848**	0.128	0.029	-0.036	0.077	-0.081	0.138	-0.044	0.030	0.046	-0.025	-0.024	0.047	-0.033
OC2	-0.003	**0.884**	0.039	-0.008	-0.025	0.060	0.051	0.053	-0.103	-0.027	0.023	0.009	-0.026	0.014	-0.055
OC3	0.012	**0.888**	0.031	0.065	0.028	0.052	0.084	0.049	-0.044	-0.002	0.006	-0.028	0.035	-0.055	0.009
OC4	-0.019	**0.781**	0.049	-0.015	0.009	0.001	-0.011	-0.064	0.015	-0.030	-0.084	0.009	0.056	-0.023	-0.067
OC5	-0.011	**0.611**	0.040	-0.056	0.026	-0.052	0.095	-0.100	0.068	-0.087	0.033	-0.120	0.026	-0.029	-0.047
PI1	0.043	0.055	**0.761**	-0.013	0.007	-0.021	0.032	0.005	0.079	0.005	-0.005	0.074	-0.024	0.074	0.009
PI2	0.043	0.029	**0.866**	0.013	0.082	-0.016	0.029	0.060	-0.009	0.016	-0.009	0.051	0.008	0.108	0.015
PI3	0.026	0.068	**0.915**	0.055	-0.028	0.041	0.052	0.038	-0.045	0.009	0.000	0.014	0.027	0.040	0.082
PI4	0.054	0.039	**0.860**	0.068	-0.069	0.013	0.119	0.041	0.023	0.017	0.045	-0.032	0.033	0.006	0.033
PI5	0.087	0.068	**0.765**	0.076	-0.095	-0.006	0.059	0.038	-0.095	0.026	0.065	-0.032	0.019	-0.037	-0.015
RR1	0.038	0.076	0.017	**0.777**	0.028	0.058	-0.009	0.119	-0.038	-0.001	-0.025	0.110	-0.031	-0.065	0.032
RR2	0.054	-0.025	0.051	**0.827**	-0.027	-0.031	-0.070	-0.026	0.031	0.041	0.012	0.093	-0.052	-0.041	0.011
RR3	0.055	0.095	0.062	**0.853**	0.090	-0.058	0.025	0.034	0.049	0.053	0.017	0.094	-0.046	-0.015	0.054
RR4	0.054	-0.022	0.060	**0.859**	0.040	0.016	0.040	0.000	0.094	-0.020	0.019	0.092	0.027	-0.034	0.004
RR5	0.068	-0.074	-0.003	**0.813**	-0.023	0.053	0.062	0.092	0.052	0.021	0.068	0.087	0.086	0.023	-0.032
TOW1	0.045	-0.011	0.043	0.096	**0.831**	0.009	0.082	0.053	0.035	0.145	-0.012	-0.061	0.032	0.070	-0.055
TOW2	0.042	-0.013	-0.016	0.052	**0.910**	0.033	0.070	0.019	-0.007	0.090	-0.040	0.018	0.058	0.052	-0.026
TOW3	0.105	0.012	0.009	0.061	**0.906**	0.012	0.052	0.023	0.033	0.103	0.015	0.003	0.108	0.047	0.039
TOW4	0.004	-0.011	-0.050	-0.025	**0.857**	0.062	0.029	0.032	0.016	0.018	0.036	0.100	0.138	-0.073	0.042
TOW5	-0.018	0.008	-0.105	-0.073	**0.796**	0.152	0.040	0.005	-0.046	-0.034	0.035	0.133	0.119	-0.109	0.031
KETD1	0.011	0.036	-0.047	-0.035	0.060	**0.852**	0.169	0.019	0.086	-0.002	0.037	0.016	0.039	-0.078	0.010
KETD2	-0.003	0.039	-0.016	-0.006	0.023	**0.899**	0.128	0.019	0.087	0.027	0.014	0.036	0.091	-0.028	0.014
KETD3	-0.021	0.086	-0.033	0.008	0.016	**0.888**	0.138	-0.036	0.094	0.009	0.035	-0.022	-0.005	0.071	-0.059
KETD4	0.040	0.068	0.041	-0.044	0.036	**0.891**	0.151	0.090	0.033	0.031	-0.035	-0.044	0.007	-0.013	-0.051
KETD5	0.083	-0.109	0.043	0.063	0.053	**0.830**	0.125	0.111	-0.031	0.103	-0.073	0.004	-0.021	0.046	0.022
KETD6	0.136	0.057	0.034	0.067	0.055	**0.740**	0.005	0.149	-0.031	0.057	-0.011	-0.049	-0.012	0.027	0.048
ECK1	-0.004	-0.009	0.174	0.060	0.079	0.041	**0.713**	0.091	0.191	0.123	-0.019	0.022	0.156	0.107	0.090
ECK2	0.034	0.018	0.073	0.009	0.059	0.156	**0.830**	0.077	0.194	0.101	-0.007	0.023	0.105	0.082	0.093
ECK3	0.064	0.119	0.035	0.031	0.115	0.191	**0.814**	0.075	0.160	0.078	0.136	0.068	0.059	0.072	0.062
ECK4	0.088	0.063	0.046	-0.026	0.027	0.240	**0.799**	0.082	0.101	0.060	0.174	0.019	0.056	0.057	0.120

ECK5	0.074	-0.099	0.012	-0.023	0.023	0.287	**0.706**	0.132	0.232	0.030	0.126	0.083	0.054	0.039	0.122
AO1	-0.047	0.100	0.067	0.032	0.049	0.074	0.059	**0.770**	0.113	0.074	0.144	0.129	-0.050	0.197	0.145
AO2	-0.049	0.038	0.080	-0.030	0.065	0.148	0.165	**0.786**	0.073	0.114	0.100	0.155	0.014	0.217	0.152
AO3	0.024	0.077	0.031	0.056	0.063	0.072	0.112	**0.855**	0.081	0.137	0.048	0.147	0.056	0.120	0.140
AO4	-0.012	0.001	0.057	0.062	0.027	0.093	0.071	**0.832**	0.098	0.137	0.048	0.006	0.065	0.140	0.064
AO5	0.032	-0.025	-0.018	0.119	-0.052	0.006	0.043	**0.796**	0.093	0.068	0.075	-0.116	0.059	0.092	0.121
EKTT1	-0.103	-0.049	-0.051	-0.086	-0.007	-0.033	0.232	0.114	**0.643**	0.185	0.048	0.134	0.070	0.159	0.113
EKTT2	-0.030	0.004	-0.054	-0.002	0.080	0.070	0.159	0.115	**0.732**	0.188	0.052	0.185	0.064	0.133	0.059
EKTT3	-0.032	-0.068	-0.006	0.029	-0.085	0.007	0.315	0.084	**0.747**	0.141	0.043	-0.025	0.007	0.121	-0.002
EKTT4	-0.012	-0.044	-0.043	0.060	-0.003	0.129	0.077	0.070	**0.819**	0.166	0.094	0.066	0.086	0.127	0.141
EKTT5	0.032	-0.039	0.030	0.062	0.037	0.065	0.137	0.089	**0.792**	0.148	0.034	-0.013	0.080	0.113	0.216
EKTT6	0.037	-0.011	0.014	0.130	0.018	0.046	0.110	0.071	**0.737**	0.098	0.088	0.006	0.062	0.071	0.181
SOIP1	-0.024	-0.077	-0.010	-0.004	0.026	0.008	0.027	0.186	0.106	**0.776**	0.029	0.129	-0.016	0.179	0.063
SOIP2	0.001	0.024	0.016	-0.004	0.038	0.064	0.085	0.105	0.114	**0.827**	0.042	0.074	0.013	0.020	0.059
SOIP3	-0.062	0.034	0.057	0.044	0.099	0.020	0.128	0.033	0.180	**0.782**	0.073	-0.015	0.098	0.064	0.132
SOIP4	0.019	-0.007	0.001	0.052	0.089	0.075	0.130	0.102	0.187	**0.758**	0.090	0.080	0.101	0.124	0.068
SOIP5	0.157	-0.055	0.016	0.034	0.101	0.079	-0.014	0.086	0.198	**0.652**	0.153	0.106	0.171	0.136	0.096
HRD1	-0.032	0.020	0.060	-0.004	0.010	0.030	0.074	0.016	0.101	0.068	**0.814**	0.057	0.111	0.166	0.001
HRD2	-0.056	0.012	0.034	0.015	-0.012	0.026	0.086	0.058	0.125	0.060	**0.874**	0.056	0.097	0.171	0.054
HRD3	-0.026	-0.038	0.029	0.097	0.033	-0.072	0.126	0.264	0.081	0.149	**0.661**	0.121	0.099	0.091	0.228
HRD4	-0.020	0.014	-0.024	0.025	0.003	-0.047	0.102	0.160	0.000	0.124	**0.751**	0.063	0.129	0.083	0.262
WAI1	-0.008	0.045	-0.080	0.219	0.017	-0.110	0.051	-0.021	-0.077	0.130	0.037	**0.769**	0.089	0.019	0.143
WAI2	0.084	0.034	-0.035	0.161	0.044	-0.009	0.034	0.020	-0.047	0.132	0.032	**0.830**	0.080	0.036	0.068
WAI3	0.028	-0.076	0.111	0.068	0.057	0.070	0.113	0.127	0.196	0.058	0.086	**0.751**	0.205	0.061	0.019
WAI4	-0.020	-0.134	0.110	0.136	0.070	-0.002	-0.019	0.171	0.258	0.027	0.134	**0.708**	0.188	0.049	0.055
OIPI1	0.092	0.068	0.112	0.003	0.095	0.043	0.066	0.060	0.041	0.014	0.027	0.107	**0.837**	0.031	0.073
OIPI2	0.067	0.016	0.121	-0.003	0.113	0.011	0.069	0.012	0.067	0.029	0.015	0.141	**0.827**	0.097	0.024
OIPI3	0.055	0.026	-0.023	-0.021	0.059	0.090	0.138	0.037	0.028	0.069	0.078	0.108	**0.878**	0.034	0.017
OIPI4	0.074	0.003	-0.125	-0.015	0.115	-0.013	0.083	0.043	0.053	0.138	0.190	0.087	**0.810**	0.076	0.014
OIPI5	-0.031	-0.081	-0.029	0.011	0.107	-0.039	0.043	0.003	0.154	0.095	0.147	0.090	**0.714**	0.158	0.044
PQI1	-0.036	-0.004	0.000	-0.030	-0.031	0.110	0.010	0.240	0.151	0.012	0.022	-0.143	0.068	**0.790**	0.063
PQI2	0.021	-0.078	0.021	-0.046	-0.030	0.016	0.065	0.149	0.174	0.003	0.047	-0.068	0.039	**0.849**	-0.002
PQI3	-0.071	0.031	0.054	-0.028	-0.022	-0.075	0.022	0.114	0.078	0.159	0.122	0.157	0.084	**0.755**	0.157
PQI4	0.066	0.017	0.102	0.028	0.023	-0.028	0.139	0.136	0.107	0.202	0.198	0.083	0.108	**0.712**	0.034
PQI5	0.086	0.012	0.041	-0.109	0.090	-0.004	0.160	0.137	0.112	0.216	0.200	0.206	0.107	**0.681**	-0.013
OSK1	0.012	-0.177	-0.007	0.071	0.027	0.022	0.106	0.107	-0.034	-0.044	0.145	0.072	0.028	0.050	**0.767**
OSK2	0.016	-0.218	0.019	-0.004	0.005	0.031	0.141	0.063	0.051	0.093	0.159	0.117	0.036	0.020	**0.792**
OSK3	0.038	-0.008	-0.006	0.017	0.002	0.024	0.089	0.157	0.183	0.148	0.122	0.017	0.037	0.063	**0.838**
OSK4	0.040	0.070	0.034	-0.027	0.004	-0.035	0.076	0.123	0.239	0.094	-0.012	-0.019	0.020	0.081	**0.821**
OSK5	0.046	0.168	0.112	0.021	-0.005	-0.065	0.021	0.143	0.205	0.128	0.005	0.117	0.039	0.011	**0.764**

Appendix a

Standard Deviation of Each Respondent

Individual Respondent	Standard Deviation	Individual Respondent	Standard Deviation	Individual Respondent	Standard Deviation	Individual Respondent	Standard Deviation
1	0.50	**45**	0.54	**89**	0.46	**133**	0.59
2	0.49	**46**	0.61	**90**	0.63	**134**	0.58
3	0.52	**47**	0.52	**91**	0.48	**135**	0.42
4	0.61	**48**	0.56	**92**	0.69	**136**	0.53
5	0.49	**49**	0.67	**93**	0.60	**137**	0.59
6	0.53	**50**	0.62	**94**	0.48	**138**	0.37
7	0.51	**51**	0.58	**95**	0.40	**139**	0.63
8	0.60	**52**	0.64	**96**	0.66	**140**	0.53
9	0.57	**53**	0.51	**97**	0.61	**141**	0.35
10	0.49	**54**	0.51	**98**	0.65	**142**	0.63
11	0.44	**55**	0.74	**99**	0.49	**143**	0.59
12	0.59	**56**	0.59	**100**	0.45	**144**	0.45
13	0.41	**57**	0.50	**101**	0.67	**145**	0.54
14	0.52	**58**	0.60	**102**	0.52	**146**	0.64
15	0.68	**59**	0.54	**103**	0.53	**147**	0.50
16	0.66	**60**	0.63	**104**	0.54	**148**	0.64
17	0.50	**61**	0.47	**105**	0.54	**149**	0.41
18	0.49	**62**	0.66	**106**	0.61	**150**	0.55
19	0.50	**63**	0.39	**107**	0.47	**151**	0.52
20	0.66	**64**	0.77	**108**	0.72	**152**	0.56
21	0.69	**65**	0.60	**109**	0.43	**153**	0.63
22	0.41	**66**	0.49	**110**	0.51	**154**	0.56
23	0.66	**67**	0.70	**111**	0.46	**155**	0.54
24	0.60	**68**	0.50	**112**	0.51	**156**	0.48

25	0.56	**69**	0.53	**113**	0.48	**157**	0.55
26	0.46	**70**	0.58	**114**	0.52	**158**	0.62
27	0.63	**71**	0.62	**115**	0.53	**159**	0.40
28	0.50	**72**	0.51	**116**	0.46	**160**	0.56
29	0.51	**73**	0.47	**117**	0.57	**161**	0.46
30	0.45	**74**	0.57	**118**	0.55	**162**	0.58
31	0.54	**75**	0.52	**119**	0.52	**163**	0.61
32	0.50	**76**	0.58	**120**	0.46	**164**	0.47
33	0.54	**77**	0.42	**121**	0.00	**165**	0.64
34	0.50	**78**	0.62	**122**	0.50	**166**	0.61
35	0.61	**79**	0.51	**123**	0.48	**167**	0.61
36	0.48	**80**	0.69	**124**	0.51	**168**	0.41
37	0.55	**81**	0.46	**125**	0.50	**169**	0.51
38	0.55	**82**	0.61	**126**	0.58	**170**	0.47
39	0.39	**83**	0.00	**127**	0.44	**171**	0.60
40	0.65	**84**	0.53	**128**	0.50	**172**	0.54
41	0.55	**85**	0.60	**129**	0.54	**173**	0.61
42	0.39	**86**	0.64	**130**	0.48	**174**	0.56
43	0.57	**87**	0.42	**131**	0.64	**175**	0.48
44	0.66	**88**	0.64	**132**	0.51	**-**	-

Appendix b

Descriptive Statistics of IV, PV and DV of Kaizen

	N	Min	Max	Mean	Std. Dev	Skewnes	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
TMCS1	173	3	5	4.03	.646	-.032	-.576
TMCS2	173	3	5	4.02	.610	-.011	-.269
TMCS3	173	3	5	4.02	.669	-.020	-.739
TMCS4	173	3	5	4.06	.630	-.049	-.462
TMCS5	173	3	5	4.07	.587	-.011	-.082
OKC1	173	3	5	4.19	.554	.057	-.103
OKC2	173	3	5	4.20	.567	.002	-.209
OKC3	173	3	5	4.18	.568	.006	-.156
OKC4	173	3	5	4.17	.575	-.014	-.187
OKC5	173	3	5	4.18	.571	-.007	-.196
PI1	173	3	5	4.08	.610	-.039	-.304
PI2	173	3	5	4.09	.631	-.074	-.487
PI3	173	3	5	4.13	.597	-.047	-.253
PI4	173	3	5	4.16	.614	-.102	-.425
PI5	173	3	5	4.14	.607	-.079	-.362
RR1	173	3	5	4.08	.517	.108	.703
RR2	173	3	5	4.09	.548	.051	.289
RR3	173	3	5	4.10	.495	.226	.892
RR4	173	3	5	4.08	.539	.062	.421
RR5	173	3	5	4.06	.525	.071	.641
TOW1	173	3	5	4.03	.505	.066	.985
TOW2	173	3	5	4.03	.499	.061	1.082
TOW3	173	3	5	4.01	.506	.022	.994
TOW4	173	3	5	4.06	.484	.169	1.244
TOW5	173	3	5	4.05	.480	.132	1.373
KETD1	173	3	5	3.88	.542	-.086	.262
KETD2	173	3	5	3.90	.529	-.111	.461
KETD3	173	3	5	3.88	.492	-.260	.861
KETD4	173	3	5	3.90	.478	-.282	1.166
KETD5	173	3	5	3.93	.512	-.111	.787
KETD6	173	3	5	3.95	.531	-.055	.571
ECK1	173	3	5	3.88	.563	-.028	.054
ECK2	173	3	5	3.86	.574	.001	-.091
ECK3	173	3	5	3.83	.561	-.032	-.070
ECK4	173	3	5	3.82	.550	-.071	-.057

ECK5	173	3	5	3.77	.584	.085	-.404
AO1	173	3	5	3.95	.676	.063	-.789
AO2	173	3	5	3.94	.657	.067	-.665
AO3	173	3	5	3.87	.661	.143	-.715
AO4	173	3	5	3.84	.607	.093	-.391
AO5	173	3	5	3.85	.601	.070	-.325
EKTT1	173	3	5	4.01	.615	-.003	-.313
EKTT2	173	3	5	3.98	.628	.017	-.433
EKTT3	173	3	5	3.89	.585	.019	-.128
EKTT4	173	3	5	3.86	.604	.068	-.327
EKTT5	173	3	5	3.82	.617	.130	-.478
EKTT6	173	3	5	3.84	.585	.035	-.216
SOIP1	173	3	5	4.04	.650	-.039	-.608
SOIP2	173	3	5	4.00	.638	.000	-.509
SOIP3	173	3	5	3.95	.636	.038	-.503
SOIP4	173	3	5	3.90	.616	.061	-.376
SOIP5	173	3	5	3.85	.591	.048	-.253
HRD1	173	3	5	4.09	.480	.242	1.198
HRD2	173	3	5	4.10	.518	.144	.594
HRD3	173	3	5	4.10	.567	.017	.064
HRD4	173	3	5	4.04	.604	-.017	-.224
WAI1	173	3	5	3.99	.476	-.018	1.513
WAI2	173	3	5	3.98	.505	-.043	.991
WAI3	173	3	5	3.95	.548	-.029	.367
WAI4	173	3	5	3.89	.585	.019	-.128
OIPI1	173	3	5	3.91	.579	.004	-.034
OIPI2	173	3	5	3.92	.550	-.042	.295
OIPI3	173	3	5	3.86	.594	.048	-.252
OIPI4	173	3	5	3.86	.567	-.015	-.051
OIPI5	173	3	5	3.84	.588	.047	-.254
PQI1	173	3	5	3.95	.593	.013	-.131
PQI2	173	3	5	3.94	.611	.034	-.306
PQI3	173	3	5	3.92	.642	.073	-.561
PQI4	173	3	5	3.93	.616	.041	-.345
PQI5	173	3	5	3.94	.648	.061	-.601
OSK1	173	3	5	3.99	.576	.000	.072
OSK2	173	3	5	4.00	.610	.000	-.270
OSK3	173	3	5	3.99	.656	.012	-.646
OSK4	173	3	5	3.97	.646	.032	-.576
OSK5	173	3	5	3.95	.667	.059	-.731

Appendix c

Revised Set of Survey Scale Items

Survey Scale	Description of Scale Items	Factors Loading	Cronbach's Coefficient (α) Values
Top Management Commitment	In your organization, top level management thinks Kaizen is important for continuous improvement of organization.	**.835**	**0.921**
	In your organization, top level management thinks quality is more important than production schedule.	**.906**	
	In your organization, performance is evaluated by the top management basing on continuous improvement in processes and quality of the product.	**.887**	
	In your organization, top management allocates enough resource for Kaizen activities.	**.872**	
	In all company level meetings, top level management discusses importance of Kaizen.	**.856**	
Organizational Kaizen Culture	In your organization, employee's participation and discussion in Kaizen activity is open.	**.795**	**0.884**
	In your organization, employees are empowered to act and communicate Kaizen results.	**.851**	
	In your organization employee's concerned ideas are access by the management.	**.903**	
	In your organization creative problem solving processes exists.	**.847**	
	In your organization, stability and continuity of order exist.	**.728**	
Personal Initiative	In your organization, Kaizen team has ability to overcome barriers.	**-.787**	**0.900**
	In your organization, Kaizen team members have	**-.897**	

	shown interest in Kaizen activities.		
	In your organization, employees are willing to give suggestions for continuous improvement.	**-.923**	
	In your organization, employees always take initiative to solve the minor problems during routine works.	**-.857**	
	In your organization, Kaizen team members respect each other's opinion & feelings.	**-.758**	
Rewards & Recognition	In your organization, financial awards are given to individual employees for excellent suggestion.	**.798**	**0.895**
	In your organization, employees are motivated through rewards and recognition.	**.836**	
	In your organization, effective profit sharing program in the form of bonus exists.	**.868**	
	In your organization, best worker of the month is nominated in each department.	**.869**	
	In your organization, employee's participation in Kaizen activities are being encouraged and awarded by senior.	**.825**	
Training of Workers	In your organization, resources are made available for training of employees.	**-.851**	**0.923**
	In your organization, employees are trained on use of different Kaizen tools & techniques.	**-.924**	
	In your organization, employees do not view new seminar or program on Kaizen as "Just another fad.	**-.921**	
	Your organization trains their employees to improve their interactive skills.	**-.867**	
	In your organization, employees are encouraged to acquire project management skills to meet deadlines.	**-.796**	
Kaizen Event & Team	In your organization, Kaizen team has enough experience of previous Kaizen activity in the	**.880**	

Design	organization.		**0.933**
	In your organization, Kaizen team leader is more experienced than other members.	**.921**	
	In your organization, Kaizen team members have been given clear goals.	**.906**	
	Kaizen team members cross functionality and autonomy have effect on Kaizen success.	**.915**	
	In your organization, Kaizen event planning and design affects the Kaizen outcomes.	**.844**	
Employees Commitment to Kaizen	In your organization, employees are committed to Kaizen activities.	**.728**	**0.904**
	In your organization, employees think that Kaizen is a good strategy for improvement.	**.886**	
	In your organization, employees think that holding Kaizen activity is good for organizational performance improvement.	**.896**	
	In your organization, employees are of opinion that Kaizen will serve an important purpose of organization performance improvement.	**.912**	
	In your organization, employees believe that Kaizen is necessary for continuous improvement of the performance of the organization.	**.776**	
Action Oriented Kaizen	In your organization employees participating in Kaizen activities, spent most of their time in work area	**.860**	**0.917**
	In your organization, employees participating in Kaizen activities spent very short time in meeting rooms.	**.851**	
	In your organization, employees participating in Kaizen activity are fully supported by facilitator.	**.907**	
	In your organization, Kaizen team spends lot of time in discussing improvement ideas before trying them out in	**.860**	

	the work area.		
	In your organization, Kaizen team members' ideas about improvement activities are given due wattage.	**.814**	
Expertise on Kaizen Tools & Techniques	In your organization, Kaizen team members have enough experience of Kaizen events.	**.721**	**0.904**
	In your organization, employees have more knowledge about Kaizen tools & techniques.	**.794**	
	In your organization, employees have better understanding of Kaizen tool & techniques.	**.793**	
	In your organization, employees participating in Kaizen activities are expert on use of 7QC tool.	**.891**	
	In your organization, employees understanding and awareness about Kaizen tools and techniques affects its outcome.	**.850**	
Standardization of Organization Internal Process	In your organization, internal processes are standardized.	**.814**	**0.875**
	In your organization, proper standards exist for each process to measure improvement through Kaizen.	**.864**	
	In your organization, standards are continuously improved through Kaizen activities.	**.826**	
	In your organization, current methods are regularly analyzed for continuous improvement and standardization.	**.804**	
	In your organization, standardization of internal process affects the Kaizen outcomes.	**.726**	
Human Resource Development	In general, Kaizen activities motivate its team members in the organization.	**-.855**	**0.863**
	In your organization, technical knowledge of the Kaizen event participant is more as compared to other employees of the organization.	**-.919**	

	Team member's skill level enhanced after each Kaizen event in your organization.	**-.705**	
	In your organization, team member's interest in Kaizen activities and attitude improved after each Kaizen event	**-.792**	
Work Area Improvement	In your organization, work area has been improved due to Kaizen activities.	**-.855**	**0.839**
	Overall achieving Kaizen goals have improved work area efficiency of your organization.	**-.919**	
	Lot of place has been made available for work through Kaizen activities in your organization.	**-.705**	
	In your organization, all work area is neat and clean due to Kaizen activities.	**-.792**	
Organization Internal Process Improvement	100% of units produced/service provided in your organization are accepted by the customers.	**.888**	**0.904**
	In your organization, manufactured products / service provided need no rework.	**.870**	
	In your organization, internal processes have been improved a lot due to Kaizen activities.	**.924**	
	Rejection rate of your organizations products / services provided is negligible.	**.830**	
	In your organization, line workers are encouraged to fix the problems they feel in the process through Kaizen activities.	**.717**	
Product Quality Improvement	The customers are satisfied with the performance of your organization's primary product.	**-.862**	**0.874**
	Your organizational products / service provided need no rework.	**-.920**	
	Your organization's products are in conformance to customer's requirement.	**-.762**	
	Quality of your organizational products has been	**-.730**	

	improved a lot due to Kaizen activities.		
	In your organization, Kaizen activities have reduced the rejection rate of your product.	**-.715**	
Overall Success of Kaizen	Overall Kaizen is perceived as success in your organization.	**.747**	**0.895**
	Benefit/ outcomes of Kaizen are sustainable in your organization.	**.791**	
	Stakeholders are satisfied with your organization's performance.	**.887**	
	Overall Kaizen activities have achieved their Kaizen goals set by your organization.	**.894**	
	Higher customer's satisfactions are being achieved through Kaizen activities in your organization.	**.828**	

Annexure E

Descriptive Statistics Showing Mean and Standard Deviation Values of IVs

S/No	N	TMC		OC		PI		RR		TOW		KETD	
		Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
1	4	4.20	0.34	4.35	0.52	4.25	0.22	4.30	0.11	4.30	0.11	3.92	0.13
2	4	4.45	0.34	4.55	0.25	4.45	0.11	4.10	0.34	4.50	0.00	4.13	0.34
3	4	4.25	0.00	4.35	0.14	4.25	0.00	4.20	0.11	4.25	0.22	3.92	0.24
4	4	4.05	0.11	4.15	0.25	4.20	0.11	4.05	0.11	4.00	0.00	3.75	0.00
5	4	4.20	0.11	4.45	0.11	4.40	0.45	4.25	0.00	4.25	0.00	4.08	0.13
6	4	3.90	0.22	4.10	0.22	4.00	0.45	3.90	0.22	3.85	0.14	3.71	0.10
7	4	4.10	0.45	4.35	0.14	4.20	0.11	4.10	0.25	3.90	0.14	3.92	0.13
8	3	4.40	0.15	3.87	0.18	3.73	0.33	4.40	0.15	4.47	0.18	4.11	0.17
9	3	3.93	0.15	4.00	0.00	4.13	0.33	3.87	0.18	4.20	0.18	3.83	0.31
10	3	3.73	0.15	4.07	0.15	3.93	0.15	3.67	0.00	4.00	0.00	3.67	0.00
11	3	4.33	0.30	4.27	0.15	4.13	0.33	4.20	0.33	4.33	0.00	4.00	0.34
12	4	4.10	0.14	4.00	0.00	4.10	0.25	3.95	0.11	4.00	0.00	3.83	0.33
13	4	4.00	0.25	4.10	0.25	4.00	0.00	4.35	0.22	3.75	0.00	3.92	0.20
14	4	3.85	0.22	3.95	0.27	3.90	0.36	4.00	0.22	3.90	0.41	4.00	0.00
15	4	4.15	0.14	4.20	0.11	3.90	0.36	4.00	0.22	3.90	0.14	4.00	0.20
16	3	3.80	0.33	4.47	0.45	4.13	0.33	4.13	0.30	4.00	0.37	3.94	0.14
17	3	4.13	0.18	4.00	0.00	4.27	0.15	3.93	0.15	3.80	0.18	4.17	0.31
18	3	4.00	0.30	4.20	0.18	4.13	0.18	3.80	0.18	3.67	0.30	3.94	0.14
19	3	4.13	0.18	4.33	0.51	4.20	0.18	4.00	0.00	3.93	0.15	3.94	0.14
20	3	4.33	0.00	4.47	0.18	4.33	0.00	4.13	0.43	3.62	0.00	4.00	0.00
21	3	4.33	0.00	4.27	0.15	4.07	0.37	4.00	0.30	4.00	0.37	3.94	0.14
22	3	4.40	0.15	4.33	0.00	4.13	0.18	4.20	0.30	4.07	0.28	4.00	0.27
23	3	4.00	0.00	4.13	0.55	3.87	0.18	3.93	0.33	3.87	0.18	4.06	0.35
24	3	3.80	0.18	4.27	0.37	3.93	0.15	3.93	0.33	4.00	0.00	4.11	0.17
25	3	4.00	0.00	4.33	0.00	4.07	0.15	4.20	0.18	4.27	0.15	3.78	0.17
26	3	3.80	0.18	4.33	0.00	3.93	0.37	4.00	0.30	3.80	0.18	3.89	0.17
27	3	4.13	0.55	4.13	0.18	4.33	0.00	4.13	0.33	4.00	0.30	3.89	0.32
28	3	4.00	0.48	4.40	0.15	4.20	0.18	3.93	0.15	3.73	0.15	3.94	0.14

29	3	4.13	0.18	4.27	0.15	4.20	0.18	3.80	0.18	4.20	0.18	4.00	0.00
30	3	3.93	0.15	4.00	0.37	4.07	0.37	4.13	0.33	4.33	0.00	3.83	0.18
31	3	4.13	0.33	4.00	0.30	4.33	0.00	4.20	0.18	4.00	0.00	4.06	0.35
32	3	3.93	0.15	4.20	0.18	4.13	0.18	3.93	0.15	4.33	0.00	3.83	0.31
33	3	3.80	0.18	4.07	0.15	4.13	0.48	3.93	0.15	4.00	0.00	3.89	0.32
34	3	3.73	0.15	4.00	0.30	3.93	0.37	3.67	0.00	3.73	0.15	3.72	0.14
35	3	4.07	0.37	4.20	0.18	4.20	0.30	4.13	0.18	4.00	0.00	3.94	0.45
36	3	3.93	0.15	4.00	0.33	4.13	0.33	4.07	0.33	4.00	0.00	3.67	0.00
37	3	4.00	0.00	4.07	0.15	4.20	0.52	4.20	0.18	4.13	0.18	3.89	0.27
38	3	4.00	0.30	4.13	0.18	4.20	0.30	4.20	0.18	4.13	0.18	3.94	0.14
39	3	4.13	0.18	4.20	0.18	4.33	0.00	4.33	0.00	4.20	0.18	4.00	0.00
40	3	4.00	0.00	4.20	0.30	4.33	0.24	4.27	0.15	4.20	0.18	3.94	0.31
41	3	3.73	0.15	3.93	0.33	4.00	0.33	3.93	0.15	3.80	0.18	3.67	0.00
42	3	3.93	0.33	4.00	0.00	3.93	0.15	4.00	0.30	3.93	0.37	3.67	0.00
43	3	4.13	0.30	4.20	0.18	4.13	0.33	4.20	0.18	4.13	0.18	3.89	0.17
44	3	3.93	0.37	4.13	0.18	4.00	0.37	4.13	0.18	3.93	0.15	3.83	0.31
45	3	3.80	0.18	4.00	0.00	3.93	0.15	4.07	0.37	4.00	0.00	3.67	0.00
46	3	3.73	0.15	3.93	0.37	3.80	0.18	3.93	0.15	3.80	0.18	3.67	0.00
47	3	4.00	0.00	4.07	0.37	4.07	0.15	4.27	0.33	4.27	0.15	4.00	0.00
48	3	4.20	0.18	4.20	0.18	4.27	0.15	4.33	0.00	4.20	0.18	4.11	0.17
49	3	4.00	0.00	4.00	0.00	4.00	0.00	4.13	0.18	4.00	0.00	3.83	0.18
50	3	3.93	0.15	4.20	0.18	4.13	0.18	4.07	0.15	4.00	0.00	3.67	0.00
51	3	3.87	0.33	4.13	0.18	3.93	0.37	3.93	0.37	3.80	0.18	3.67	0.00
52	3	4.13	0.33	4.40	0.15	4.20	0.30	4.20	0.18	4.13	0.18	4.00	0.00
53	3	4.20	0.33	4.47	0.45	4.33	0.30	4.27	0.15	4.20	0.33	4.11	0.17
54	3	4.07	0.37	4.40	0.45	4.20	0.18	4.20	0.18	4.07	0.15	4.00	0.34
Total (Avg)	173	4.04	0.20	4.18	0.21	4.12	0.23	4.08	0.20	4.04	0.14	3.91	0.16
Max Value		4.45	0.55	4.55	0.55	4.45	0.52	4.4	0.43	4.5	0.41	4.17	0.45
Min Value		3.73	0	3.87	0	3.73	0	3.67	0	3.62	0	3.67	0

Annexure F

Descriptive statistics Showing Mean and Standard Deviation Values of PVs

Org	N	ECK		AOK		EKTT		SOIP	
		Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
1	4	4.10	0.22	4.00	0.50	4.21	0.27	4.10	0.41
2	4	4.35	0.14	4.25	0.00	4.33	0.26	4.30	0.27
3	4	4.05	0.25	4.00	0.27	3.92	0.20	4.20	0.41
4	4	3.80	0.11	3.90	0.14	3.83	0.13	3.90	0.14
5	4	3.90	0.14	4.20	0.34	4.04	0.10	4.10	0.36
6	4	3.75	0.00	3.60	0.50	4.13	0.23	3.60	0.50
7	4	3.90	0.14	3.90	0.50	4.21	0.23	3.90	0.14
8	3	4.13	0.18	4.13	0.33	3.94	0.31	4.13	0.33
9	3	3.80	0.18	4.00	0.00	3.89	0.27	3.87	0.48
10	3	3.67	0.51	3.80	0.30	3.67	0.34	3.67	0.30
11	3	4.07	0.15	4.13	0.33	3.89	0.17	4.00	0.37
12	4	3.95	0.11	4.00	0.25	4.00	0.37	3.80	0.25
13	4	3.80	0.25	3.90	0.36	3.92	0.24	4.00	0.27
14	4	3.70	0.11	3.80	0.25	3.88	0.23	4.00	0.39
15	4	3.65	0.36	3.90	0.14	3.79	0.27	3.80	0.25
16	3	3.93	0.15	3.93	0.15	4.00	0.49	3.93	0.15
17	3	3.67	0.00	3.73	0.15	3.72	0.35	3.80	0.42
18	3	3.67	0.30	3.60	0.15	3.67	0.44	4.00	0.30
19	3	3.87	0.33	3.73	0.15	3.89	0.34	4.00	0.51
20	3	4.00	0.00	3.93	0.15	4.06	0.35	3.93	0.37
21	3	3.93	0.55	3.93	0.15	4.00	0.37	4.13	0.33
22	3	3.93	0.37	4.00	0.48	4.11	0.17	4.20	0.30
23	3	3.67	0.37	3.73	0.15	3.94	0.31	3.87	0.33
24	3	3.67	0.00	3.67	0.30	3.72	0.35	3.80	0.18
25	3	3.80	0.55	3.80	0.18	4.00	0.44	3.93	0.51
26	3	3.67	0.30	3.67	0.30	3.83	0.31	4.13	0.48
27	3	3.93	0.33	3.93	0.15	4.06	0.35	4.13	0.33
28	3	3.73	0.33	3.80	0.18	3.89	0.34	4.00	0.37
29	3	4.00	0.30	4.07	0.33	3.83	0.31	4.13	0.48
30	3	3.67	0.30	3.80	0.18	4.00	0.37	3.67	0.00

31	3	3.87	0.18	3.80	0.18	3.83	0.31	4.13	0.18
32	3	3.73	0.15	3.67	0.30	3.89	0.17	3.93	0.15
33	3	3.73	0.15	3.73	0.51	3.67	0.27	3.80	0.30
34	3	3.67	0.00	3.67	0.30	3.89	0.32	3.73	0.45
35	3	3.80	0.18	3.80	0.18	3.78	0.17	4.00	0.30
36	3	3.67	0.00	3.73	0.15	4.00	0.44	3.93	0.33
37	3	4.07	0.33	4.00	0.00	3.89	0.44	4.00	0.30
38	3	3.80	0.30	3.80	0.18	4.06	0.14	4.00	0.37
39	3	3.73	0.15	3.73	0.33	4.00	0.52	4.13	0.33
40	3	3.93	0.33	4.13	0.18	3.61	0.14	4.20	0.18
41	3	3.73	0.15	3.73	0.15	3.61	0.14	3.73	0.33
42	3	3.60	0.15	3.80	0.18	3.83	0.31	3.67	0.37
43	3	3.93	0.15	3.87	0.18	3.78	0.32	3.93	0.37
44	3	3.73	0.15	4.00	0.00	3.72	0.14	3.93	0.37
45	3	3.60	0.15	4.00	0.37	3.61	0.35	3.87	0.30
46	3	3.73	0.33	3.73	0.51	3.89	0.17	3.73	0.28
47	3	3.93	0.15	4.00	0.37	4.00	0.34	4.00	0.48
48	3	4.07	0.45	4.13	0.18	3.83	0.31	3.93	0.51
49	3	3.73	0.48	4.00	0.00	3.50	0.18	3.73	0.15
50	3	3.73	0.15	3.67	0.00	3.61	0.45	3.67	0.30
51	3	3.73	0.33	3.80	0.55	3.89	0.49	3.73	0.51
52	3	3.60	0.15	4.00	0.51	3.83	0.48	4.00	0.37
53	3	4.00	0.37	4.13	0.18	4.06	0.14	4.20	0.30
54	3	4.00	0.18	4.00	0.37	4.00	0.64	4.13	0.33
Total Average	**173**	**3.83**	**0.22**	**3.88**	**0.24**	**3.89**	**0.30**	**3.95**	**0.33**
Max Value		**4.35**	**0.55**	**4.25**	**0.55**	**4.33**	**0.64**	**4.3**	**0.51**
Min Value		**3.6**	**0**	**3.6**	**0**	**3.5**	**0.1**	**3.6**	**0**

Annexure G

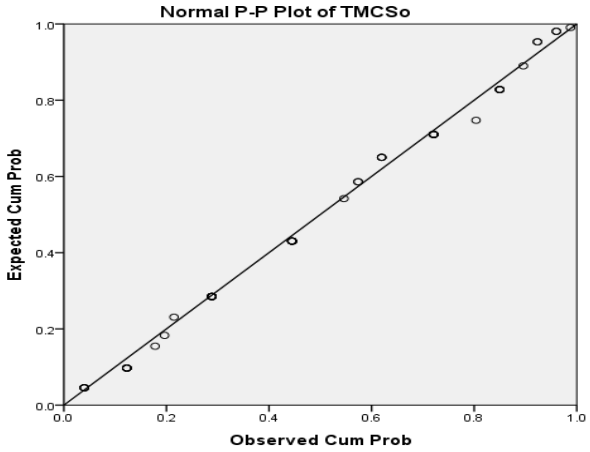
Descriptive statistics Showing Mean and Standard Deviation Values of DVs

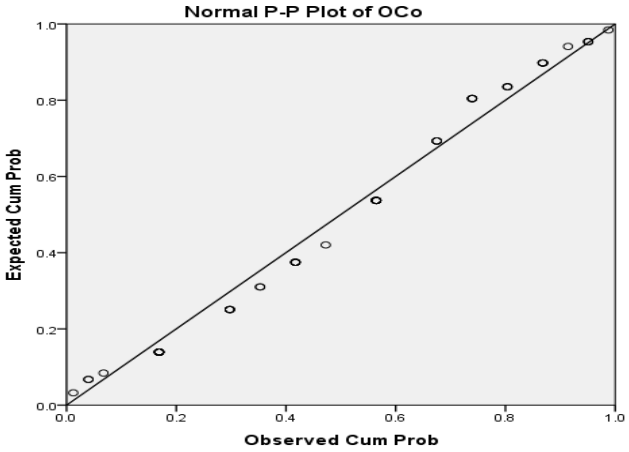
S/No	N	HRD		WAI		OIPI		PQI		OSK	
		Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
1	4	4.31	0.13	4.13	0.25	4.00	0.22	4.15	0.36	4.10	0.22
2	4	4.50	0.29	4.31	0.27	4.20	0.34	4.35	0.22	4.30	0.11
3	4	4.31	0.13	4.13	0.14	4.00	0.00	4.20	0.27	4.10	0.39
4	4	4.13	0.43	3.88	0.14	3.80	0.27	3.95	0.34	3.90	0.14
5	4	4.31	0.13	4.13	0.14	4.00	0.00	4.25	0.22	4.10	0.25
6	4	3.94	0.27	3.69	0.27	3.60	0.14	3.95	0.11	3.80	0.47
7	4	4.13	0.36	3.94	0.27	3.80	0.34	4.20	0.34	4.00	0.36
8	3	4.33	0.00	4.17	0.33	4.00	0.30	4.13	0.33	4.20	0.53
9	3	4.00	0.38	3.92	0.17	3.80	0.18	3.93	0.33	3.93	0.15
10	3	3.83	0.19	3.75	0.36	3.67	0.30	3.73	0.70	3.73	0.15
11	3	4.25	0.17	4.00	0.53	4.00	0.00	4.07	0.51	4.13	0.33
12	4	4.00	0.00	3.88	0.14	3.80	0.39	3.80	0.34	3.90	0.22
13	4	4.13	0.25	3.75	0.00	3.70	0.25	3.90	0.14	4.00	0.39
14	4	4.00	0.00	3.75	0.00	3.70	0.11	3.80	0.50	3.90	0.47
15	4	4.06	0.13	3.75	0.00	3.70	0.11	3.85	0.31	3.90	0.36
16	3	4.25	0.17	3.92	0.50	3.93	0.15	3.93	0.37	4.13	0.33
17	3	4.00	0.38	3.75	0.36	3.73	0.15	3.80	0.30	3.93	0.37
18	3	3.92	0.17	3.67	0.00	3.60	0.15	3.80	0.48	3.80	0.33
19	3	4.08	0.17	3.83	0.19	3.80	0.18	3.93	0.15	4.00	0.37
20	3	4.17	0.19	3.92	0.17	3.93	0.15	4.00	0.30	4.07	0.37
21	3	4.25	0.17	4.00	0.33	3.93	0.15	4.00	0.00	4.13	0.18
22	3	4.33	0.33	4.08	0.17	4.00	0.37	4.13	0.48	4.20	0.18
23	3	3.92	0.17	3.83	0.19	3.80	0.30	3.87	0.48	3.80	0.18
24	3	3.92	0.17	3.92	0.17	3.80	0.18	3.93	0.58	3.80	0.18
25	3	4.17	0.19	4.08	0.36	3.93	0.15	4.07	0.33	4.00	0.30
26	3	3.92	0.17	3.83	0.33	3.73	0.15	3.73	0.15	3.80	0.18
27	3	4.08	0.17	4.00	0.38	3.93	0.45	4.00	0.37	4.00	0.00
28	3	4.00	0.00	3.92	0.36	3.87	0.30	3.93	0.15	3.87	0.18

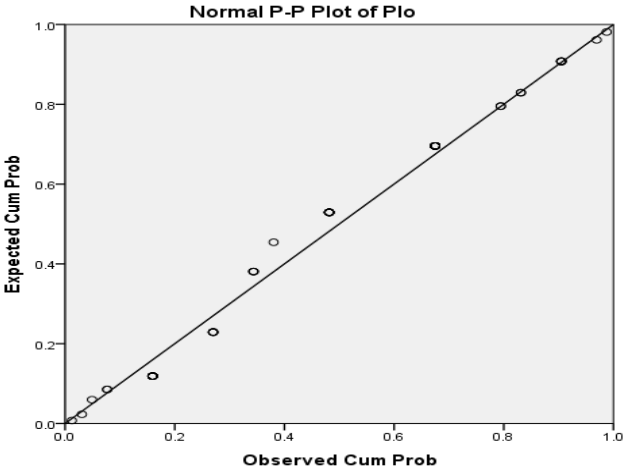
29	3	4.17	0.33	4.08	0.17	4.07	0.15	4.13	0.43	4.00	0.00
30	3	4.00	0.38	3.92	0.17	3.93	0.33	4.00	0.00	3.93	0.15
31	3	4.17	0.19	3.92	0.36	4.07	0.37	3.87	0.55	4.13	0.33
32	3	4.00	0.00	3.92	0.17	3.93	0.15	3.93	0.15	4.33	0.00
33	3	4.00	0.00	3.92	0.17	3.87	0.18	3.67	0.30	3.93	0.37
34	3	3.83	0.19	3.75	0.17	3.67	0.00	3.60	0.15	3.73	0.15
35	3	4.08	0.32	4.08	0.50	4.00	0.00	3.93	0.46	4.00	0.37
36	3	4.00	0.00	3.92	0.17	3.87	0.33	3.87	0.18	3.93	0.15
37	3	4.08	0.36	4.00	0.00	3.93	0.15	4.07	0.33	4.00	0.00
38	3	4.08	0.17	4.00	0.33	3.87	0.18	3.87	0.33	4.00	0.48
39	3	4.17	0.19	4.08	0.17	4.00	0.00	3.80	0.18	4.07	0.37
40	3	4.17	0.19	4.08	0.17	4.00	0.00	4.07	0.15	4.13	0.33
41	3	4.00	0.00	3.83	0.19	3.73	0.15	3.60	0.15	3.93	0.33
42	3	3.92	0.17	3.92	0.17	3.80	0.18	3.73	0.33	3.87	0.33
43	3	4.08	0.17	4.08	0.36	4.00	0.00	4.00	0.00	4.07	0.15
44	3	4.00	0.00	4.00	0.53	3.93	0.15	3.73	0.37	3.93	0.15
45	3	3.92	0.36	3.92	0.17	3.80	0.33	3.67	0.30	3.87	0.30
46	3	3.92	0.17	3.83	0.19	3.73	0.15	3.80	0.18	3.73	0.33
47	3	4.17	0.19	4.08	0.36	4.00	0.37	3.80	0.30	4.00	0.33
48	3	4.17	0.19	4.08	0.17	4.13	0.18	4.07	0.33	4.13	0.18
49	3	3.92	0.36	4.17	0.19	3.80	0.46	3.87	0.30	3.93	0.37
50	3	3.92	0.17	3.92	0.17	3.73	0.37	3.73	0.45	3.80	0.30
51	3	3.83	0.19	3.75	0.17	3.67	0.00	3.73	0.33	3.73	0.15
52	3	4.08	0.36	4.17	0.19	4.00	0.37	4.00	0.00	4.00	0.00
53	3	4.17	0.19	4.17	0.33	4.20	0.33	4.13	0.33	4.07	0.48
54	3	4.08	0.32	4.08	0.36	4.07	0.37	4.00	0.37	4.00	0.37
Total (Avg)	**173**	**4.08**	**0.19**	**3.95**	**0.23**	**3.88**	**0.20**	**3.93**	**0.30**	**3.98**	**0.26**
Max Value		**4.5**	**0.43**	**4.31**	**0.53**	**4.2**	**0.46**	**4.35**	**0.7**	**4.33**	**0.53**
Min Value		**3.83**	**0**	**3.67**	**0**	**3.6**	**0**	**3.6**	**0**	**3.73**	**0**

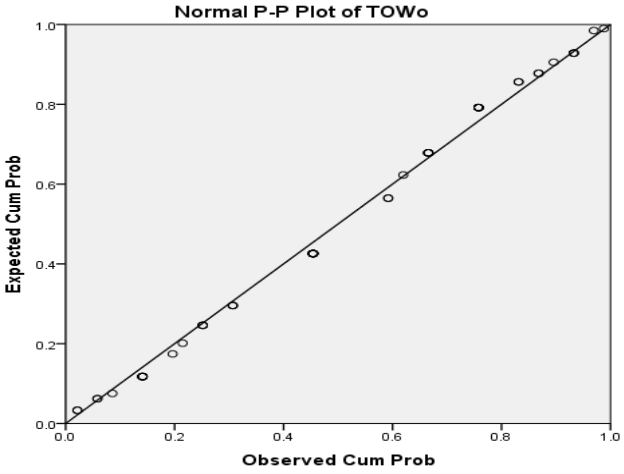
Annexure H

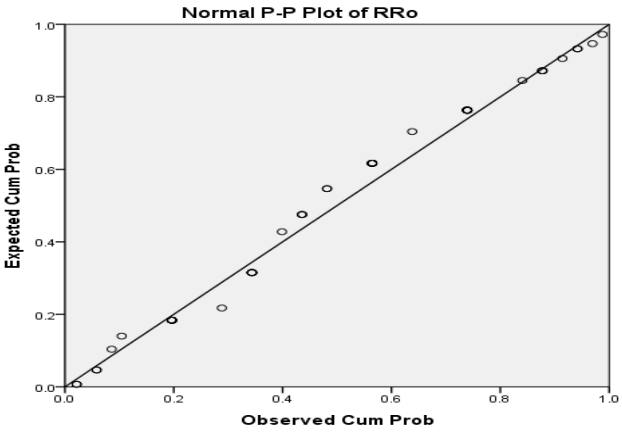
Normal P-P plot for Independent Variables

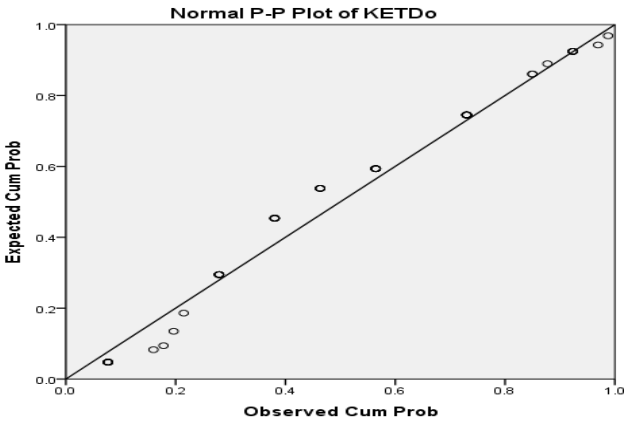






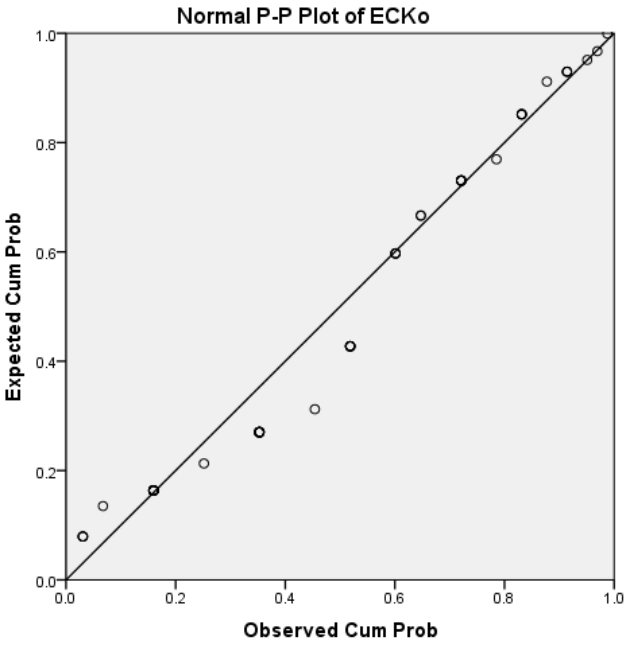


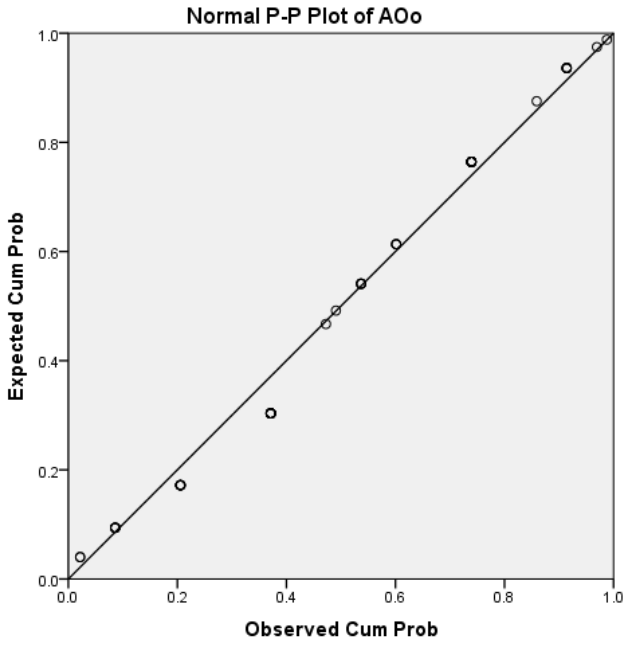


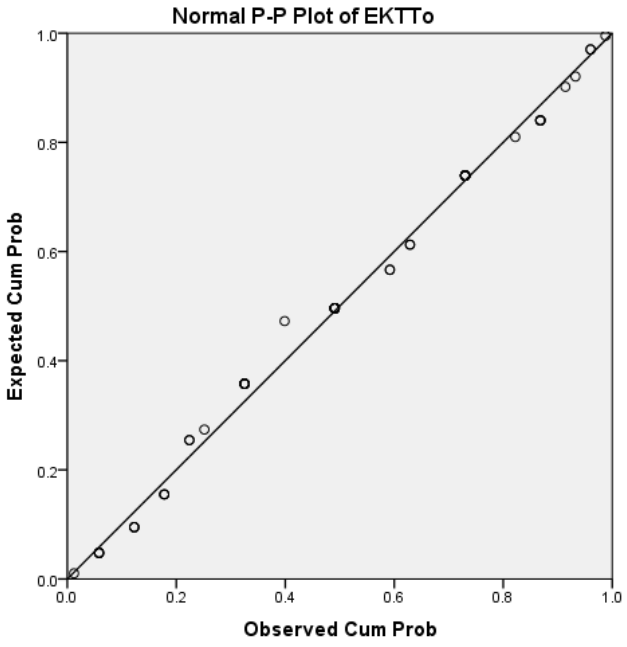


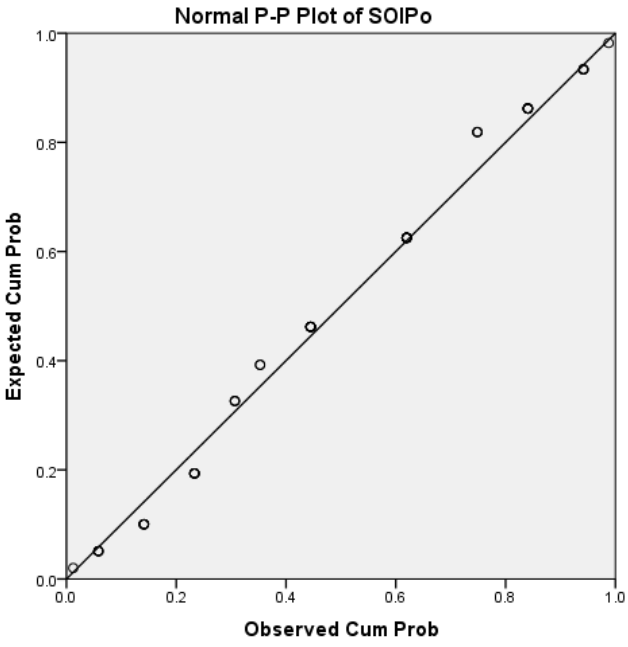
Annexure I

Normal P-P plot of Process Variables (PV)



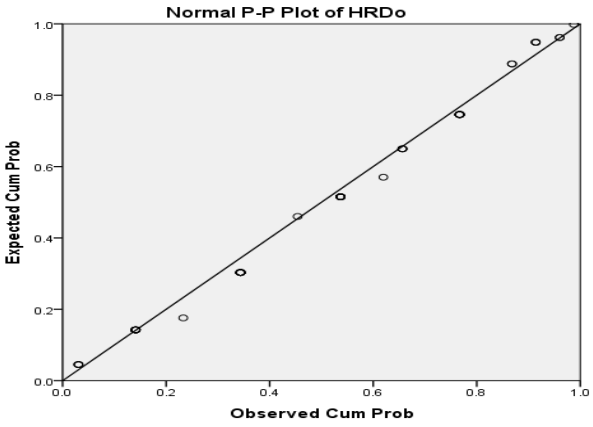


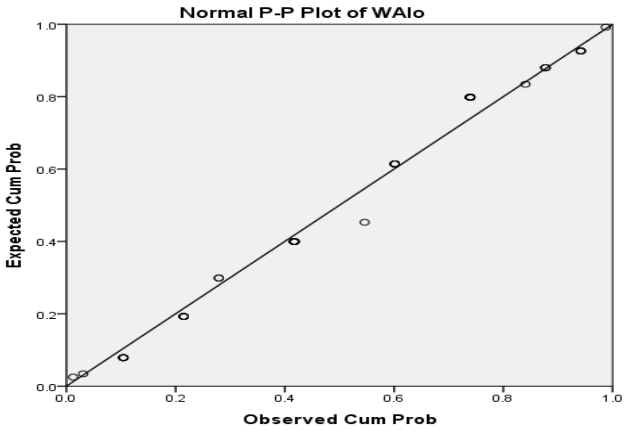


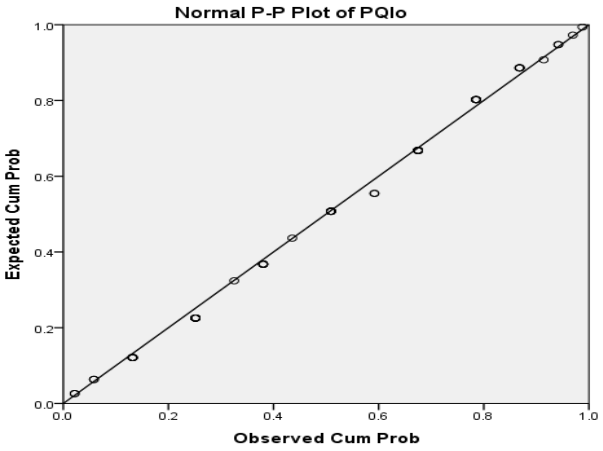


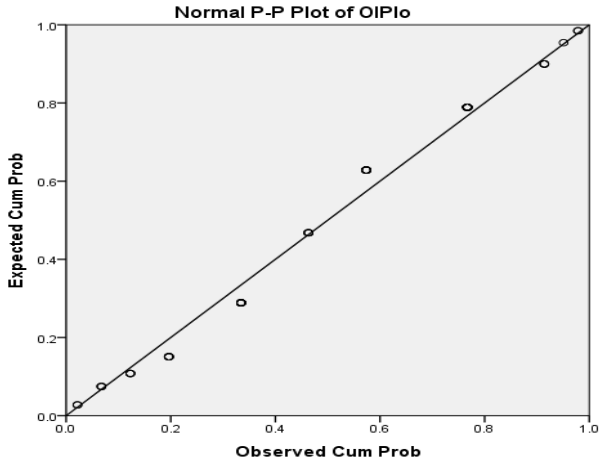
Annexure J

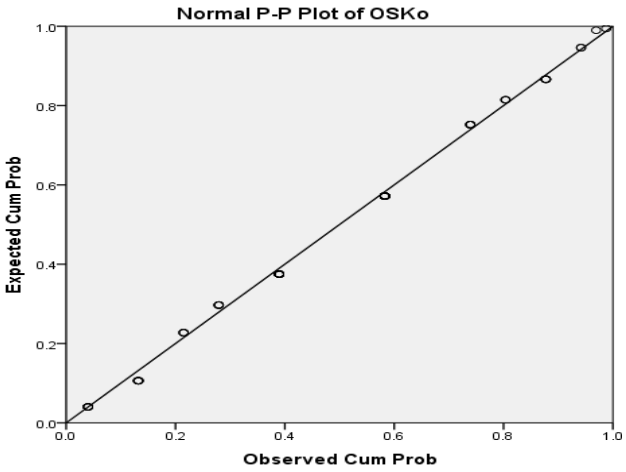
Normal P-P plot of Dependent Variables (DV)





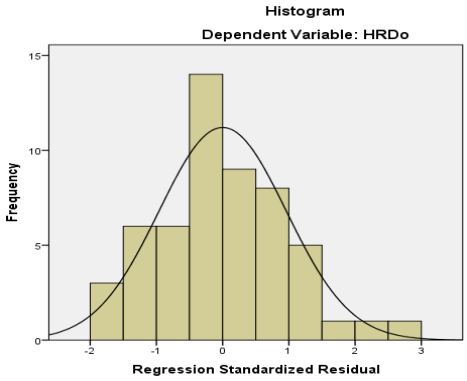


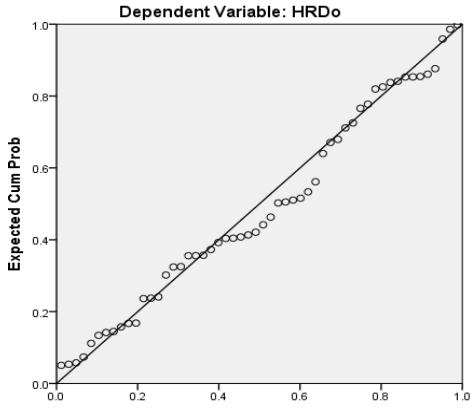


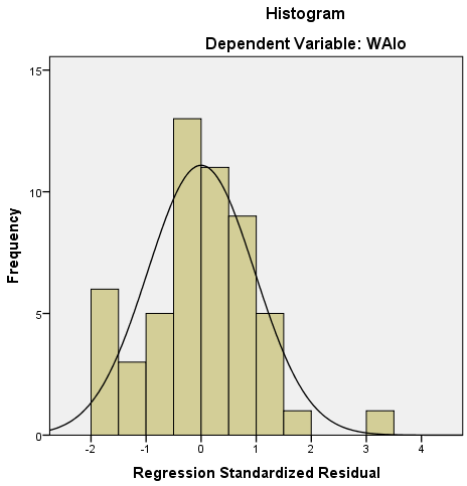


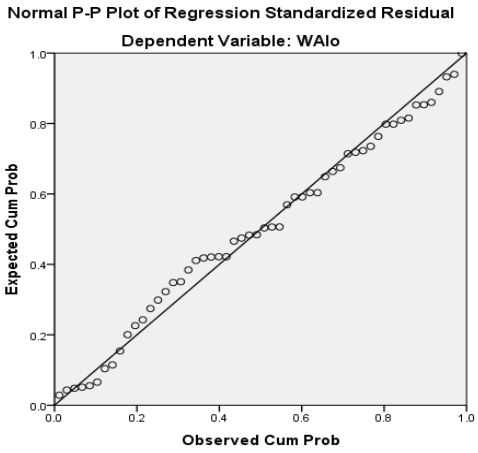
Annexure K

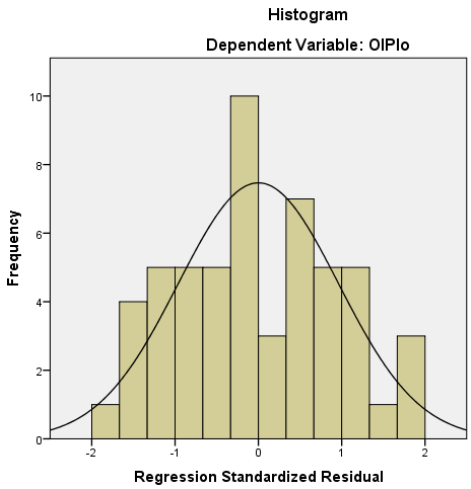
Normal P-P Plot and Histogram of Regression Standardized Residual for DVs

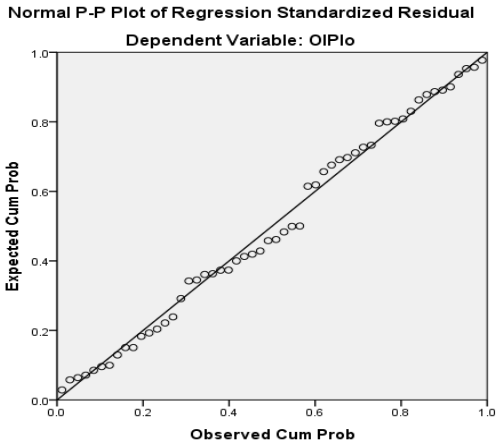


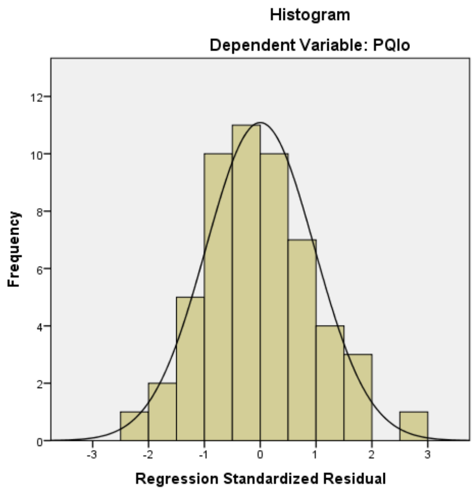


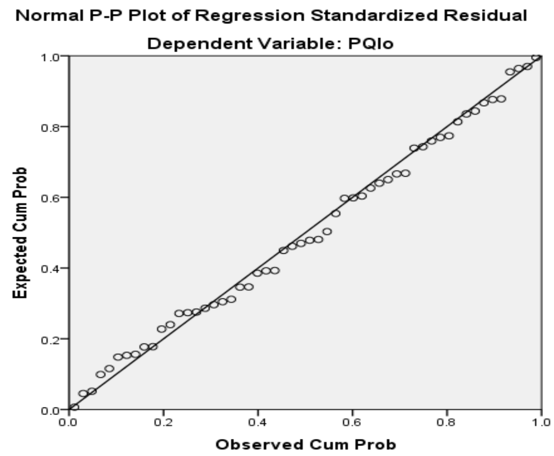


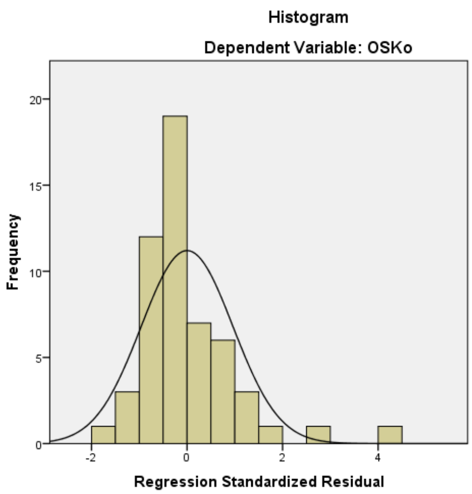


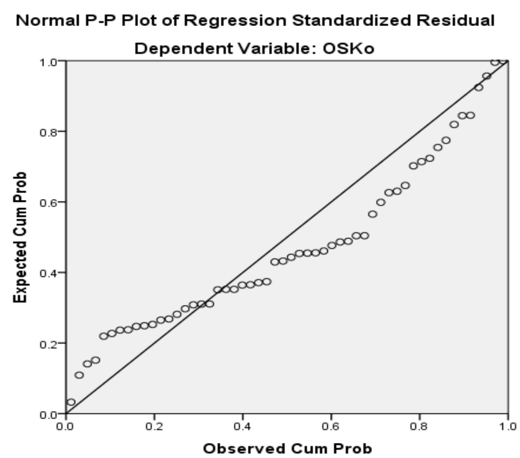





Histogram
Dependent Variable: PQIo
Frequency
Regression Standardized Residual

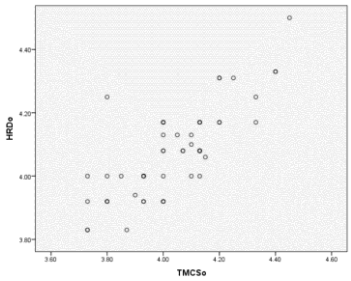

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PQIo
Expected Cum Prob
Observed Cum Prob

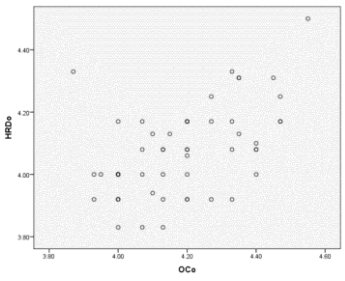

Histogram
Dependent Variable: OSKo
Frequency
Regression Standardized Residual

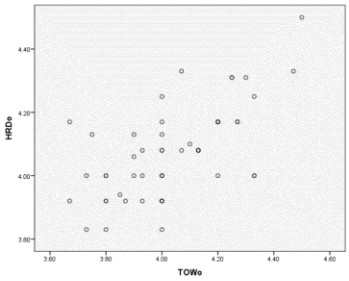

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: OSKo
Expected Cum Prob
Observed Cum Prob

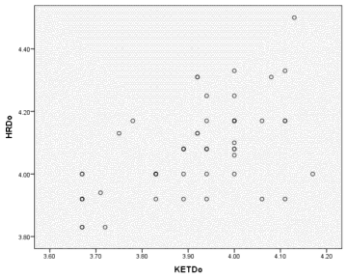
Annexure L

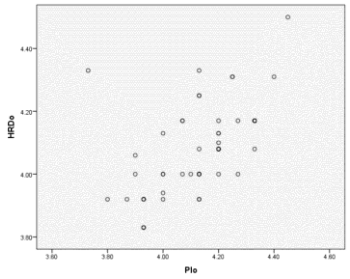
Scatter Plot Showing Linear Relationship between IVs and DVs

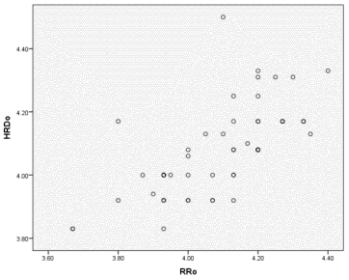


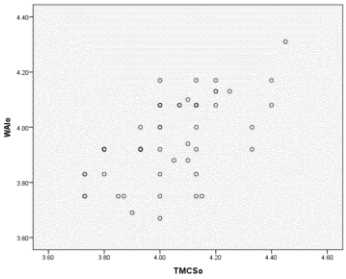


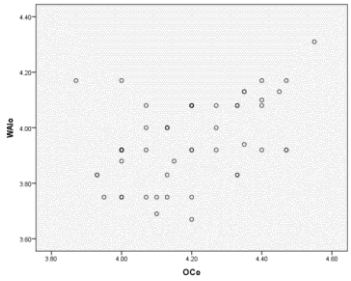


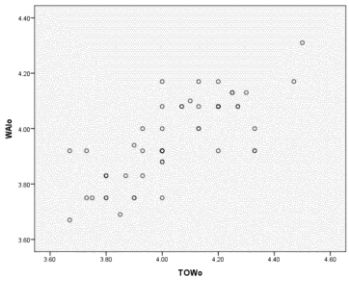


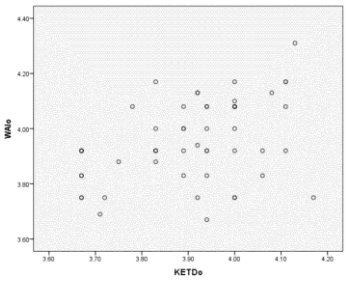


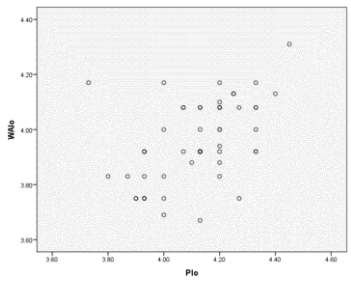


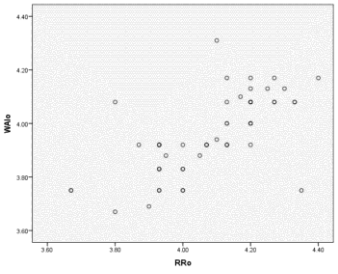


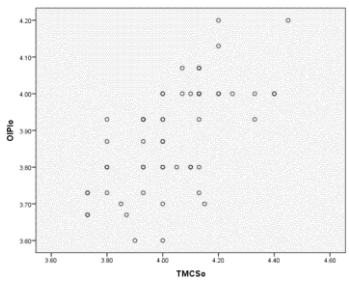


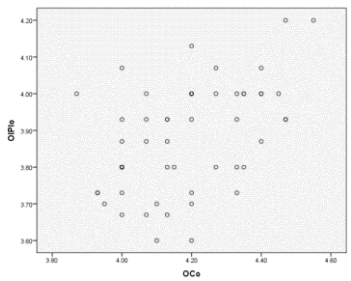


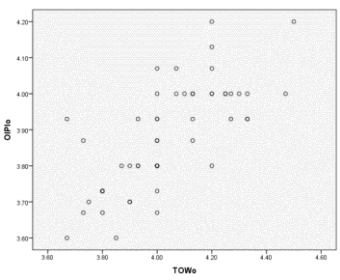


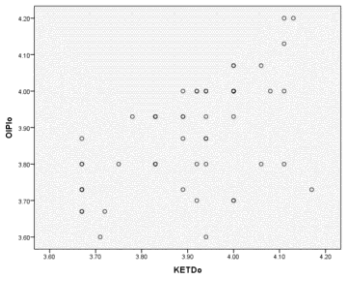


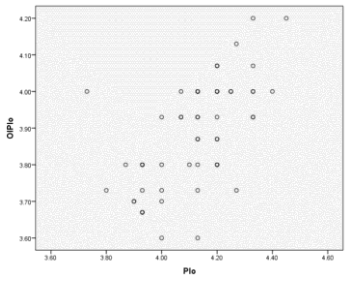


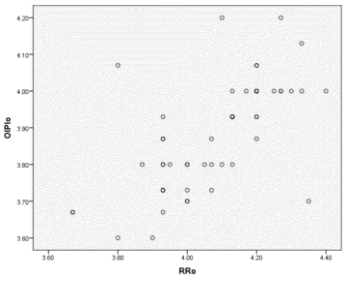


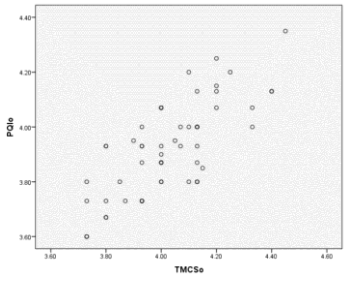


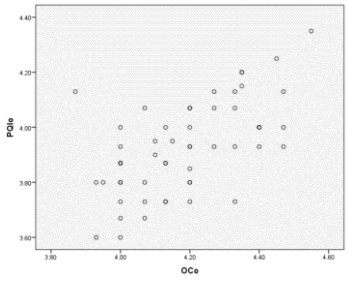


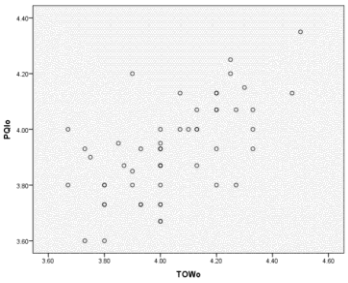

OIPIe
KETDe

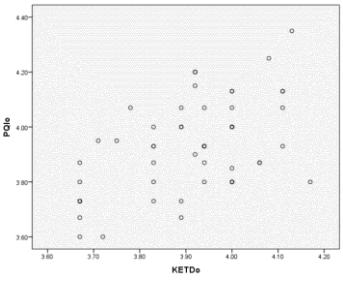

OIPIe
PIe

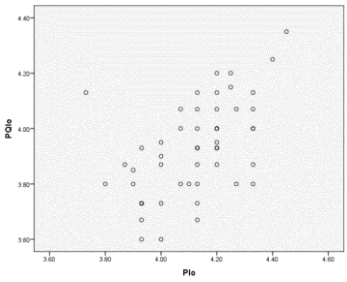

OIPIe
RRe

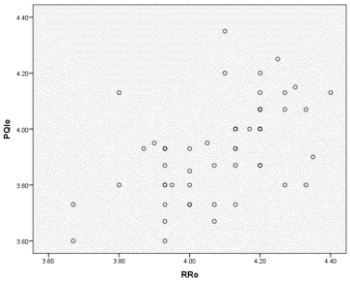

POIe
TMCSe


POIe
OCe


POIe
TOWe


POIe
KETDe


POIe
PIe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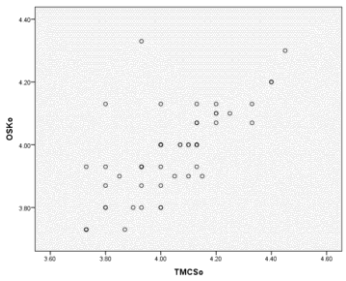
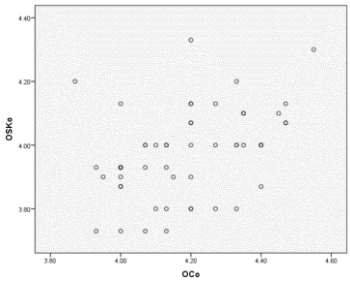
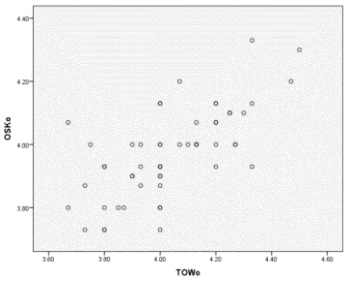
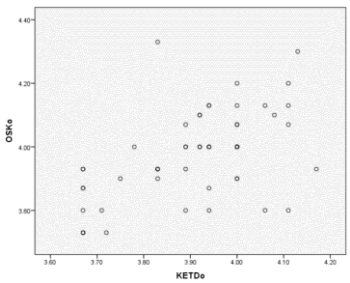
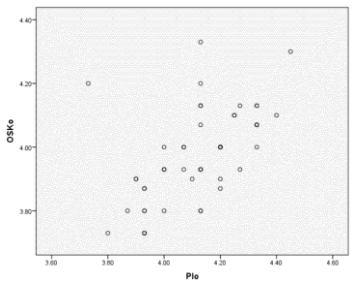
RRe

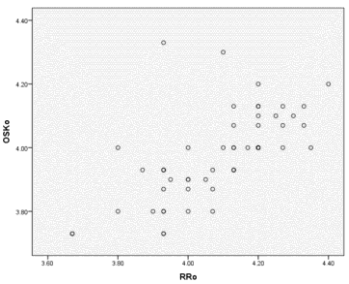

OSKe
TMCSe


OSKe
OCe


OSKe
TOWe


OSKe
KETDe


OSKe
PIe


OSKe
RRe

Annexure M

Scatter Plot for Dependent Variable of Kaizen