

## A Study Of Impact Of Continual Improvement And Employees Involvement On Iso Certified And Non Certified Construction Industries In Karnataka

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### ABSTRACT.

The privatization, globalization and liberalization leading to the tough competition among the industries. Retainment of quality plays the vital role of any industry for to success and profit. Quality practices increases the productivity and efficiency of industries. Hence all the industries irrespective of nature of work are trying to get the quality tag and to follow the Quality Management Systems, that leads to profit and success. Good quality management practices reduces the risk and wastage of materials. The main aim of industries to complete the project within the time with quality. All the industries irrespective of their nature are adopting the International Standards of organization (ISO) as a best Quality Management System. Construction industries also following the Quality requirements for ISO Certification eventhough the nature of work is not uniform. Nowadays ISO becoming a effective Quality tool for the industries. Hence it is needed to study the positive impact of ISO standards on the construction industries. The questionnaires are prepared concentrating the two critical quality factors. The questionnaires are distributed to the industry employees and the responses were collected, and the conclusions are drawn based on the results obtained. An SPSS of Verson 16 used for analysing the data's. From the results it was observed that the ISO certified industries are good in case of continuous improvement and employees involvement. From the study it was concluded that the ISO implementation does not give a hundred percent quality for the industries. But the ISO certified industries will take relaxed view after getting the ISO certification. The industries which are not certified by the ISO are taking the business very seriously rather than the ISO certified industries. They work towards giving the better quality. It is also observed in the ISO certified industries that the more number of respondents are undecided. This means the employees are free to decide on the benefits or loss due to ISO adoption.. The ISO Certified industries are having marginally better quality than the non - ISO Certified Industries.

**Keywords:**International standards organization, Quality management practices, Critical quality factors, Quality management systems.

## 1. INTRODUCTION

The construction industries have to compete globally in this privatization era, there needs a quality tag for the industries to achieve the quality in terms of technical and managerial functions. There is a great need of quality in all the stages of the industries from planning, designing, processes to execution as per plan. A good design gives a quality structure in terms of durability and strength. The quality refers to the internal and external customers satisfaction. It also corresponds to the standard methods adopted by the Industries for a quality management systems which leads to durable, strong and sound structure, so that customers get satisfaction. There is a great demand for lowering the expenses without compromising the quality. It is better to adopt the quality management system to avoid wastage of time and money. It also avoids reworks and wastage of materials.

### 1.1 Study scope

The study focuses on the construction industries of Karnataka in India. Total 28 industries are selected out of which 14 are ISO - certified and other 14 are non- certified by ISO. The questionnaires are prepared by focusing on the objectives of the study.

### 1.2 Research questions

The questionnaires are prepared by concentrating to the two Critical Quality factors such as Continual Improvement and Employees Involvement.

### 1.3 Study hypothesis

Hypothesis derived based on the assumption that the quality of the Construction industries which are Certified by the ISO standards are good compared to the non ISO certified industries.

#### The assumed hypothesis are below

1. Involvement of employees are higher in the ISO certified industries rather than the non ISO certified industries.
2. ISO certified industries practice continual improvement more effectively than the non-Certified industries.

### 1.4 Original contributions

The questions are prepared from the IS/ISO 9004 : 2000 and from IS / ISO 9001: 2000. The questionnaires also based on the literature survey experience.

The data's were collected in two stages from the respondents. In the first stage the industries were selected through the convenience sampling and in the second stage the employees are also selected based on the convenience sampling methods, the responses are collected based also on their willingness and availability of the employees. The permission was

taken by the industry authorities to conduct the Survey. The questionnaires are prepared and sent to the employees of construction industries through mail. The information also collected by visiting the industries and taking the responses directly from them.

The construction industries in Karnataka are selected for the data collection. About 28 industries in Karnataka were selected for the Survey, in which 14 industries are ISO certified and 14 industries are non ISO certified. The data's collected depends upon the experience of the employee's. The questions are framed such that to cover all the attributes of the quality management system. While collecting the data's, the importance of survey was explained to them those who are willing to participate in the survey. Before taking the responses from the respondents, it was ensured that the Questions are clearly understood by them. The questions are prepared and modified by the TQM experts. About 1093 responses were collected out of which 552 responses are from ISO certified and 541 responses are from non ISO certified industries.

The questions are framed to collect the data's having the range from strongly agree (as a 5 point) to the strongly disagree ( as a point 1) with the codal values 5,4,3,2 and 1 respectively to assess the level of agreement and also the level of disagreement.

The questionnaires prepared and the data's collected were validated by consulting the TQM / field experts. The cronbach's alpha test was conducted to check the reliability of the tool for different variables of a group's. The reliability values for critical quality factors are greater than 0.6, hence the values are accepted.

## 1.5 Analysis tools

The questionnaires are framed based on the employee involvement and continual improvement's dimensions to get the responses from the respondents. The questions related to the respective dimensions are categorised. The analysis was carried out by using the software SPSS of version 16. The tools used were Cronbach's alpha test, chisquare test, Correlation analysis, independent sample t-test and factor analysis test

## 2. Research gaps

The literature reviews concentrates more on the usefulness of implementation of ISO standards in the construction industries. From the research review it is concluded that the construction industries of India are lagging the critical quality factors such are training, team building, internal and external communications, customers satisfaction etc.

There is a lot of quality difference between the construction industries that are Certified by Indian Standard Organization and not Certified by the Indian Standard Organization.

Because of privatization , liberalization and globalization there exists a competition among the industries that needs a quality tag for a construction industries. It is found that all the industries irrespective of their nature's are adopting the ISO quality management system. Hence it is needed to study the positive effects of ISO implementation on the construction industries.

## 2.1 Research Objectives

1. To study the employee's involvement in the ISO certified and non - ISO certified industries.
2. To assess the continual improvement in the ISO certified and non - ISO certified industries.

## 2.2 Problem Statement

It is needed to compare the findings of a previous research scholars with the present findings. Since there is no common opinion among the researchers. Comparative study has to be made between the construction industries that are Certified and non - certified by the ISO. The present study focuses on the impact assessment of ISO standards on the construction industries that are Certified and non - certified by the ISO standards. This forms the basis for the study. ISO becomes a famous quality management system and are adopted by all the industries, irrespective of their nature. Studies reveals that ISO benefits are easily achieved by the industries where the work nature is common. But in case of construction industries, the owners , projects, location of sites, quality goals, design and specifications, engineers are all different for every projects. Hence it is needed to study the positive effects of ISO implementation on the construction industries.

## 3. Research methodologies

Methodology deals with identification of method of collecting the data's , how the required information was gathered, regarding framing of the questionnaires, it's distribution, administration of the data's, statistical analysis and interpretation, and organising the information.

### 3.1 Framing of the questionnaires

The questions are prepared from the IS/ISO 9004 : 2000 and from IS / ISO 9001: 2000. The questionnaires also based on the literature survey experience.

### 3.2 Design of sample

The data's were collected in two stages from the respondents. In the first stage the industries were selected through the convenience sampling and in the second stage the employees are also selected based on the convenience sampling methods , the responses are collected based also on their willingness and availability of the employees. The permission was taken by the industry authorities to conduct the Survey. The questionnaires are prepared and sent to the employees of construction industries through mail. The information also collected by visiting the industries and taking the responses directly from them.

### 3.3 Data collection

The construction industries in Karnataka are selected for the data collection. About 28 industries in Karnataka were selected for the Survey, in which 14 industries are ISO certified and 14 industries are non ISO certified. The data's collected depends upon the experience of the

employee's. The questions are framed such that to cover all the attributes of the quality management system. While collecting the data's, the importance of survey was explained to them those who are willing to participate in the survey. Before taking the responses from the respondents, it was ensured that the Questions are clearly understood by them. The questions are prepared and modified by the TQM experts. About 1093 responses were collected out of which 552 responses are from ISO certified and 541 responses are from non ISO certified industries.

### 3.4 Framework

The questions are framed to collect the data's having the range from strongly agree (as a 5 point ) to the strongly disagree ( as a point 1) with the codal values 5,4,3,2 and 1 respectively to assess the level of agreement and also the level of disagreement.

### 3.5 Reliability and Validity

The questionnaires prepared and the data's collected were validated by consulting the TQM / field experts. The cronbach's alpha test was conducted to check the reliability of the tool for different variables of a group's.

### 3.6 Analysis

The data analysis started with the comparison of two types of group's, one which is ISO certified and another which is non-certified by ISO. In order to check the response patterns of both the group's, the chisquare test was conducted. The agreement level of both group's are assessed by the mean of the responses. Each Questions represent the respective attributes. The significant level difference was assumed to be 5%. The test results show whether there exists a significant level difference or not with respect to the means of two group's. The correlation test was conducted to check the relationship among the groups. If the coefficient of correlation values varies between the two variables lies less than plus or minus the 0.300, then it is noted that the relationship is weak (low relationship). If the correlation value exists more than plus or minus the 0.300, then there exists a more relationship between the variables. Some questions has a common relationship between them, to check the common underlying factors between the Questions, the factor analysis test was carried out. In the factor analysis it was observed that each factor has a strong relationship with the single Question and each questions are loaded with the single factor. Each hypothesis has a relationship with specific dimensions. The overall index of both the group's of different dimensions of attributes are calculated. Based on the hypothesis testing, the conclusions were drawn on the basis of the relative level of existence between the two group's. Hypotheses testing has done to arrive at the correct conclusions.

## 4. Involvementof employees

Employees involvement in all the activities of the industries leads to increase the effectiveness and to build a good team. A feeling of belongingness is needed for every employee which helps to create a good environment and good work culture in the construction industries.

The attributes of the involvement of employees are listed below

1. Creative ideas and efforts.
2. Working in team to achieve the goal.
3. Employees involvement in setting the objectives
4. Establishing the team and individual objectives

#### 4.1 Continual improvement

There needs a continuous improvement in the industry for upgradation in various departments to match the customers requirements and to get customers satisfaction, as the customers needs changes from time to time. Suggestions and scheme's, case studies, quality circles are helpful in the continual improvement. The attributes of the continual improvement are

1. Effectiveness and efficiency enhancements.
2. Validation and overview of improvements.
3. Cost of quality awareness.
4. Balanced documentation.

#### 4.2 Socio economic data:s of respondents

The responses from the employees of various Construction industries are collected and analysed using the statistical tools explained later. The socio-economic data's of employees are given in the below table.

**Table 1 : Gender of the respondents**

Si. No	Sex	Number of respondents	Percentage
1	Male Employees	991	90.67
2	Female Employees	102	9.33
3	Total	1093	100

The survey data collected from the 90.67% of male respondents and 9.33% from the female respondents of various construction industries in Karnataka.

The age groups of respondents are given below

**Table 2 : Age groups of respondents**

Si. No	Respondent's Age	Number of Respondents	Percentage
1	Less than 30 years	590	54%
2	31 to 35 year's	93	8.5%
3	36 to 40 year's	81	7.41%
4	41 to 45 year's	119	10.88%
5	46 to 50 year's	82	7.5%
6	51 to 55 year's	92	8.42%
7	Above 55 year's	36	3.29%
8	Total	1093	100%

The table gives the information on the age of the respondents. The majority of the respondents belongs to age group below 50 years and 54 percent of respondents are below 30 years. About 60 percent of the industries surveyed are old and about 40 percent of the respondents are young industries.

The education qualification of a employees are given in the table below

**Table 3: Degree's of employees**

Si. No	Education qualification of respondents	Number of respondents	Percentage
1	M. Tech	241	22%
2	BE / B. Tech	438	40%
3	Other degree	53	4.84%
4	Diploma	251	22.96%
5	Others	110	10.06%

In the table, about 22 percent of employees hold M. Tech degrees, 40 percent of employees hold BE/B.Tech degrees, 4.84 percent of respondents hold other degrees like B.sc, M.sc, B.Com, M.Com etc, about 23 percent of respondents hold diploma degrees and 10 percent of employees hold other technical training courses.

The table 4 gives the details of the work experience of the employees.

**Table 4 : Work experience of employees**

Si. No	Number of year's	Number of employees In ISO certified industries	Number of employees In non - ISO certified industries	Total
1	1 to 5 year's	49	63	112 (10.23%)
2	6 to 10 year's	63	47	110 (10.06%)
3	11 to 15 year's	30	70	100 ( 9.14%)
4	16 to 20 year's	48	45	93 ( 8.50%)
5	21 to 25 year's	101	154	255 (23.33%)
6	26 to 30 year's	123	98	221 (20.21%)
7	31 to 35 year's	74	37	111 ( 10.18%)
8	Above 35 year's	64	27	91 (8.35%)
	Total	552 ( 50.50%)	541 (49.50%)	1093 (100%)

From the above table it is observed that about 8.35 percent of respondents had their work experience between 35 year's and above which includes the responses from both the ISO certified industries and Non - ISO certified industries. About 10.18 percent respondents had work experience between 31 to 35 year's. About 20.21

percent of respondents had their work experience between 26 to 30 year's and about 23.33 percent of respondents had their work experience between 21 to 25 year's. About 8.50 percent of respondents had their work experience between 16 to 20 year's and about 9.14 percent of respondents had their work experience between 11 to 15 year's and about 10.06 percent of respondents had their work experience between 6 to 10 year's. About 10.23 percent of respondents had their work experience between 1 to 5 year's including both the ISO certified and Non - ISO certified industries.



**5. Survey data analysis**

The attributes of the Critical Quality factors are discussed individually based on the attributes which are belongs to the respective quality factors.

**5.1.1 Employee involvement analysis**

The quality factor employee involvement reflected in the following attributes and are

1. Framing of individual and team objectives
2. Innovative efforts promotion.
3. Team effort for result evaluation and process management.
4. Involvement of employees in the decision making and in objectives settings.

. The Cronbach's alpha test performed to check the reliability of the responses. The Cronbach's value found to be 0.76 which is a acceptable value.

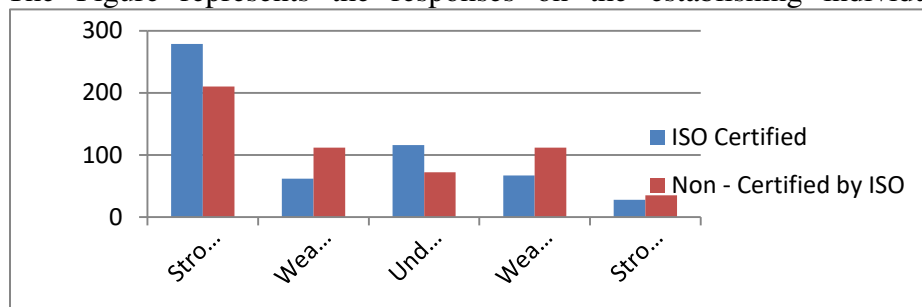
**Table : 5**

Responses for the establishing individual and team objectives

Statu s	Strong ly Agree	Weakl y Agree	Undeci ded	Weakl y Dis Agree	Stron gly Dis Agree	Total	Me an	Vari ance	Stan dard Devi ation	Sig 2- Taile d Test
ISO- Certif ied	279 (50.5)	62 (11.2)	116 (21.0)	67 (12.1)	28 (5.0)	552 (100)	3.9	1.65	1.28	0.004
Non – ISO Certif ied	210 (38.8)	112 (20.7)	72 (13.3)	112 (20.7)	35 (6.4)	541 (100)	3.64	1.81	1.34	

Note : Response percentages are shown in brackets.

The Figure represents the responses on the establishing individual and team objectives



**Figure : 1 Responses for the establishing individual and team objectives**

Table 5 shows the responses for the establishing individual and team objectives .About 17 percent of respondents from ISO certified industries and 27 percent of respondents from Non - Certified industries disagrees for this attribute. About 21 percent of respondents of ISO certified industries are undecided on this factor. Hence it is needed to check the response patterns of both the group's. The chi - square test was conducted and the value found to be 58.982 which is greater than the tabulated value for 4 degrees of freedom and significance level of 0.05. There exists a difference in response patterns of both the group's. The means calculated for both groups are found to be 3.90 and 3.64 for ISO certified and non certified industries respectively. To check whether any difference between the two means the two tailed t-test was conducted and the value found to be higher than the tabulated value hence there exists a difference among two groups. The organisations which are ISO certified are having a preference for establishing of individual and team objectives.

**Table: 6 Responses on encouragement for innovative efforts**

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	226 (40.94)	96 (17.39)	126 (22.82)	72 (13.04)	32 (5.79)	552 (100)	3.74	1.61	1.27	0.110
Non - ISO Certified	178 (32.90)	159 (29.39)	69 (12.75)	83 (15.34)	52 (9.61)	541 (100)	3.60	1.78	1.33	

Note : Response percentages were given in the brackets.

The Figure represents the responses on the Encouragement for innovative efforts

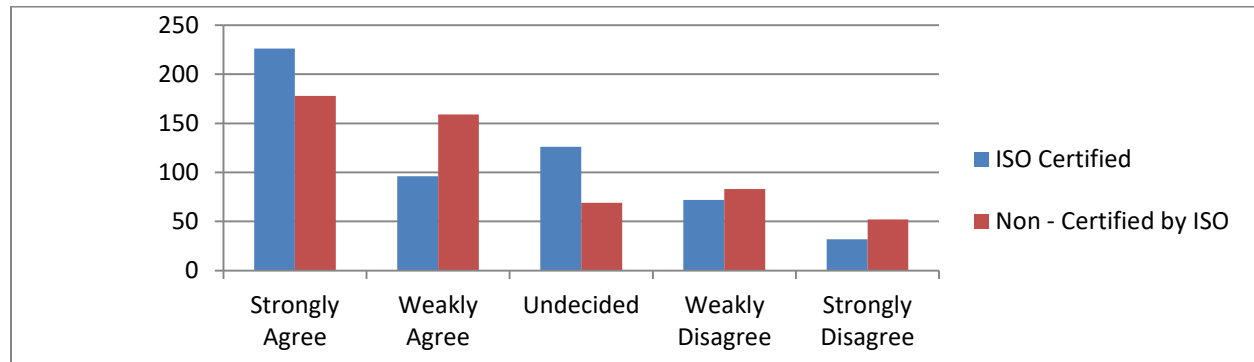


Figure : 2 Responses on encouragement for innovative efforts

Table 6, deals with the encouragement for innovative efforts. About 25 percent of respondents from the Non - ISO certified industries are not agrees for this factor against the 19 percent respondents in the Certified category. About 22 percent of respondents are undecided on this factor in ISO certified industries. Hence it is needed to test for response patterns of both the group's. The Chi - square test was conducted and the value found to be 69.9 for 4 freedom degree. The tabulated value is less, hence there exists a difference between the two groups response patterns . The means for ISO certified and Non - certified industries are 3.74 and 3.6 respectively. To check the difference in means of two groups, a two tailed t-test was conducted and the value found to be greater than tabulated value , which shows that there is a significant difference. Hence there isa good encouragement for innovative efforts in ISO certified industries rather than the non ISO certified industries.

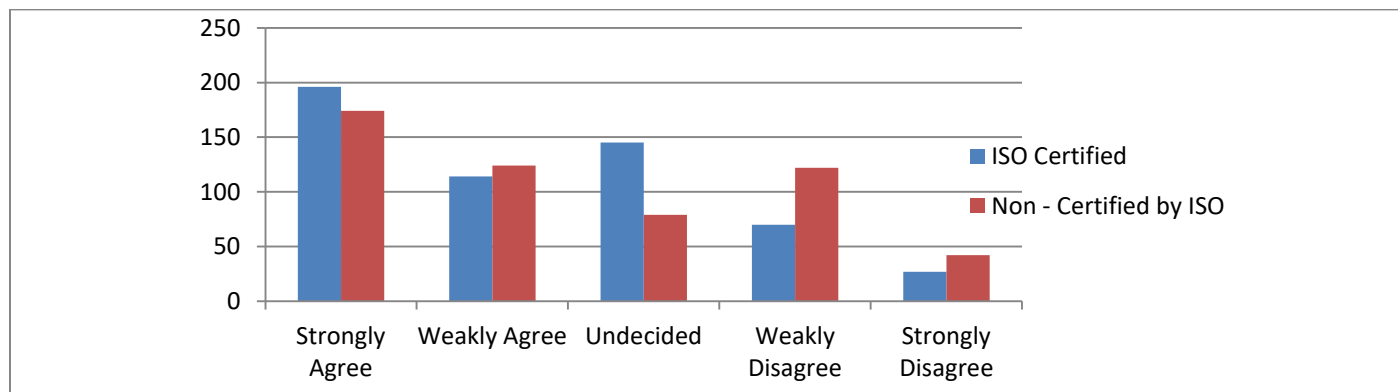
Status	Stron gly Agree	Weak ly Agree	Undecid ed	Weak ly Dis Agree	Strong ly Dis Agree	Tot al	Mea n	Varia nce	Standa rd Deviati on	Sig 2- Tail ed Test
ISO- Certifi ed	196 (35.50)	114 (20.65)	145 (26.26)	70 (12.68)	27 (4.89)	552 (100)	3.69	1.47	1.21	0.023
Non – ISO Certifi ed	174 (32.16)	124 (22.92)	79 (14.60)	122 (22.55)	42 (7.76)	541 (100)	3.49	1.81	1.34	

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**Table : 7. Responses on the employees are the part of team which manages performance process and result evaluation**

Note : Response percentages are shown in the brackets.

The figure represents the responses on the employees are the part of team which manages performance process and result evaluation.



**Figure :3 Responses on the employees are the part of team which manages performance process and result evaluation**

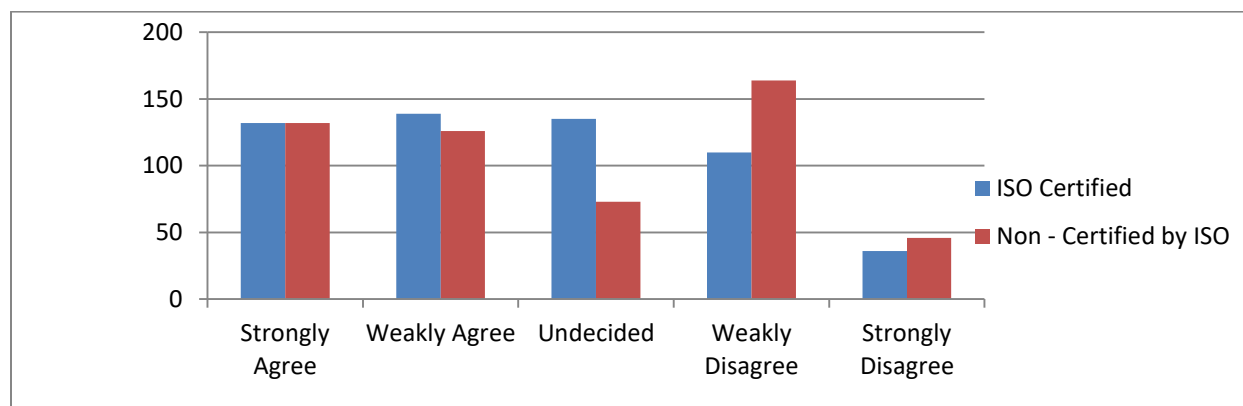
Table 7, shows the responses on the employees are the part of team which manages performance process and result evaluation. About 30 percent respondents of Non - ISO certified industries are not agrees for the factor against the 17 percent of respondents of ISO certified industries. About 26 percent respondents of ISO certified industries are undecided on this factor. Hence it is needed to check the response patterns of both the group's. The Chi - square test was conducted and the value found to be 41.64 which is greater than the tabulated value for 4 degrees of freedom. Hence there exists a significant level difference between the two groups. The means of both type of groups are 3.69 and 3.49 respectively. It is needed to check the difference between the means. The two tailed t-test was conducted and the value found to be little more than the tabulated value. Hence there exists small difference between the twogroups. The ISO certified industries involve the employees to make a team which manages performance process and result evaluation.

**Table : 8 Responses for objective settings and decision making**

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	132 (23.91)	139 (25.18)	135 (24.45)	110 (19.92)	36 (6.52)	552 (100)	3.4	1.51	1.22	0.507
Non – ISO Certified	132 (24.39)	126 (23.29)	73 (13.49)	164 (30.31)	46 (8.5)	541 (100)	3.24	1.79	1.33	

Note : Response percentages are shown in the brackets.

The figure represents the responses on the **objective settings and decision making**



**Figure : 4 Responses for objective settings and decision making**

Table 8, shows the responses for objective settings and decision making. About 39 percent of respondents are not agrees for the factor in Non - ISO certified industries against the 26 percent of respondents of ISO certified industries. About 24 percent of respondents are undecided on this factor in ISO certified industries. It is needed to check the response patterns of both the group's. The Chi - square test was conducted and the value found to be 37.07 which is greater than the tabulated value for 4 freedom degree. Hence there exists a difference in response patterns. The means calculated for both type of industries are 3.4 for Certified industries and 3.24 for non certified industries. It is needed to check the difference in means of

two groups. The two tailed t-test was conducted and the value found to be little more than the tabulated value. Hence there is smaller difference between the two groups. More number of employees are involved in the objective settings and in decision making process in the ISO certified industries rather than the non ISO certified industries.

Correlation matrix test was conducted to know whether there exists any relationship between the Questions of the same groups. The results are given in the table below

**Table : 9 Employees Involvement Correlation Matrix**

Variables	Innovative efforts promotion	Team effort for result evaluation and process management	Involvement of employees in the decision making and in objectives settings
Framing of individual and team objectives	0.319 <sup>**</sup> (0.000)	0.252 (0.00)	0.284
Innovative efforts promotion		0.374 (0.00)	0.210 (0.00)
Team effort for result evaluation and process management <sup>***</sup>			0.324 (0.00)

The Table 9, shows the attributes of the involvement of employees for various managerial levels. If the correlation coefficient was less than the + or - the 0.300, then there is less relationship between the attributes and viceversa. From the table it was observed that the value found to be more only between

1. Framing of individual and team objectives, and innovative efforts promotion.
2. Involvement of employees in decision making and in setting of objectives.

Correlation was less in the other cases. From the correlation analysis it was found that some of the Questions are related to each other and some questions are not independent. Hence it is needed to identify the common factors among the Questions. The rotation factor analysis was performed to know the relative factors. The results as follows below

**Table: 10 Analysis of rotation factor test**

Attribute	F1	F2	F3	F4
Framing of individual and team objectives	0.133	0.100	0.949	0.255
Innovative efforts promotion	0.079	0.178	0.263	0.941
Team effort for result evaluation and process management.	0.155	0.965	0.095	0.169
Involvement of employees in the decision making and in objectives settings	0.975	0.153	0.123	0.074
Variance percentage	25.00	25.50	23.00	22.00

From the table 10, Rotation factor analysis , it was observed that ,

1. The factor F1 is closely related or strongly related to the . Involvement of employees in the decision making and in objectives settings, the relation with others are less. Therefore the factor identified as involvement of the employees in objectives settings and in decision making.
2. The factor F2 is closely related or strongly related to the team effort for result evaluation and process management ,the relation with other factors are considered weak. Hence this factor signifies the team effort in process management and in results evaluation.
3. The factor F3 is closely or strongly related to the framing of individual and team objectives, and the relation with other factors are weak. Hence it is named as framing of individual and team objectives.
4. The factor F4 is closely or strongly related to the Innovative efforts promotion , and the relation between the other factors are weak. Hence the factor is named as innovative efforts promotion.

Variance of each factors are almost same , each factor loaded with one question only.

**Table :11 Mean scores for the Involvement of Employees**

Type	Employees in involvement in objectives settings and in decision making	Process management and results evaluation	Framing of individual and team objectives	Innovative initiatives	Overall index for employees involvement
ISO Certified Industries	3.4 (1.22)	3.69 (1.213)	3.90 (1.28)	3.74 (1.27)	3.68
ISO non Certified Industries	3.24 (1.33)	3.49 (1.34)	3.64 (1.34)	3.60 (1.33)	3.49

The Table 11, represents the means of Employee Involvement. It is concluded from the table that no difference found between the both the type of groups for performance management and innovative initiative concerned. There is a significant difference exists between other factors . Hence the framed hypothesis are " Higher level of employees involvement in the ISO certified industries than that of non ISO certified industries."

### 5.1.2 Analysis of Continual improvement

The attributes of Continual Improvements are given below

1. Improvement of Effectiveness & Efficiency.
2. Overview & Validated Improvements
3. Balanced (Accurate) Documentation
4. Cost of Quality Awareness

The Reliability test was conducted to know the reliability of responses and the value found to be 0.78 which is a acceptable good value.

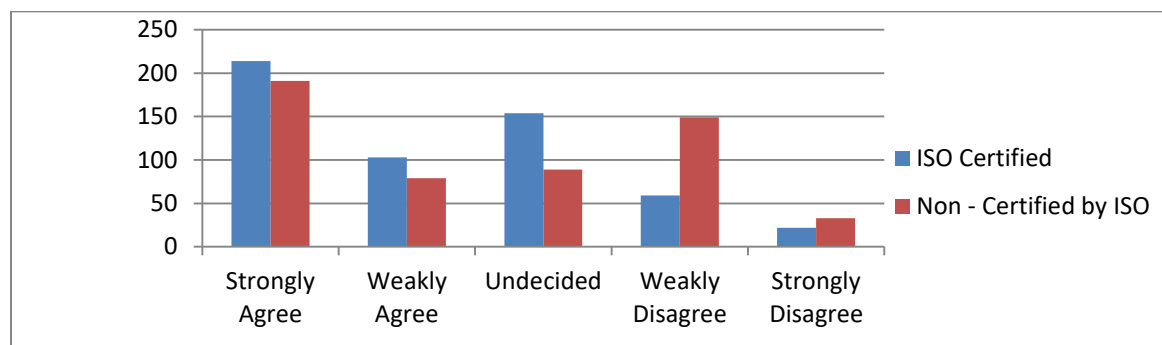


**Table : 12 Responses on the continual improvement of the processes of the organization.**

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	214 (38.76)	103 (18.65)	154 (27.89)	59 (10.68)	22 (3.98)	552 (100)	3.77	1.4	1.18	0.000
Non – ISO Certified	191 (35.30)	79 (14.60)	89 (16.45)	149 (27.54)	33 (6.09)	541 (100)	3.45	1.87	1.36	

Note : The response percentages are shown in the brackets.

The figure represents the responses on Continual Improvement of the processes of the organization.



**Figure: 5 Responses on the continuous improvement**

Table 12, Shows the responses on the Continuous Improvement. About 33 percent of respondents of Non - Ccertified industries are disagree to this factor against the 15 percent response in Certified industries . More number of responses about 28 percent are undecided from Certified industries. Hence it is needed to check the response patterns of both the group's. The Chi - square test was conducted and the value found to be 70.12 which is greater than the tabulated value for 4 degrees of freedom and for significant level of 0.05. Hence there exists a difference among the groups. The means of two groups are 3.77 and 3.42 for both the groups of certified and non certified firms respectively. It is needed to check the difference of means among the two groups. The two tailed t-test was conducted and the value found to be more than the tabulated value. Continual improvement exists in the ISO certified industries as it is the mandatory criteria for ISO certification , correction and corrective measures are taken at the right

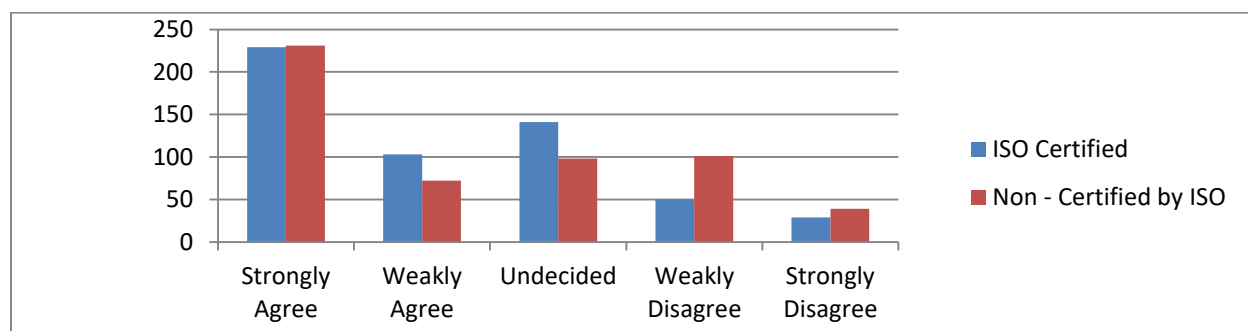
time in case of ISO certified industries. There is a chance for defect identification in Non - ISO Certified industries only when final output comes .Hence the continual improvement criteria is good in ISO Certified industries rather than in the non - ISO Certified industries.

**Table : 13 The responses for the overviewed and validated improvements**

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	229 (41.4)	103 (18.65)	141 (25.54)	50 (9.05)	29 (5.25)	552 (100)	3.82	1.47	1.21	0.052
Non - ISO Certified	231 (42.6)	72 (13.30)	98 (18.11)	101 (18.66)	39 (7.2)	541 (100)	3.65	1.88	1.37	

Note : Response percentages are shown in the brackets.

The figure represents the responses on overviewed and validated improvements



**Figure: 6 the responses for the overviewed and validated improvements**

Table 13, shows the responses for the overviewed and validated improvements. It shows whether the improvements are overviewed and validated or not. About 26 percent of respondents from the Non - Certified industries are disagree with the factor against the 14 percent responses in ISO certified industries. About 26 percent of respondents are undecided on this factor. Hence it is needed to check the response patterns of both the group's . The Chi - square test was conducted and the value found to be 32. 192 which is nearly greater value compared to the tabulated value for 4 degrees of freedom. Hence there exists a significant level difference. The means are 3.82 for certified and 3.65 for non certified industries. It is needed to check the mean of the two groups. Two tailed t-test was conducted and the value found to be

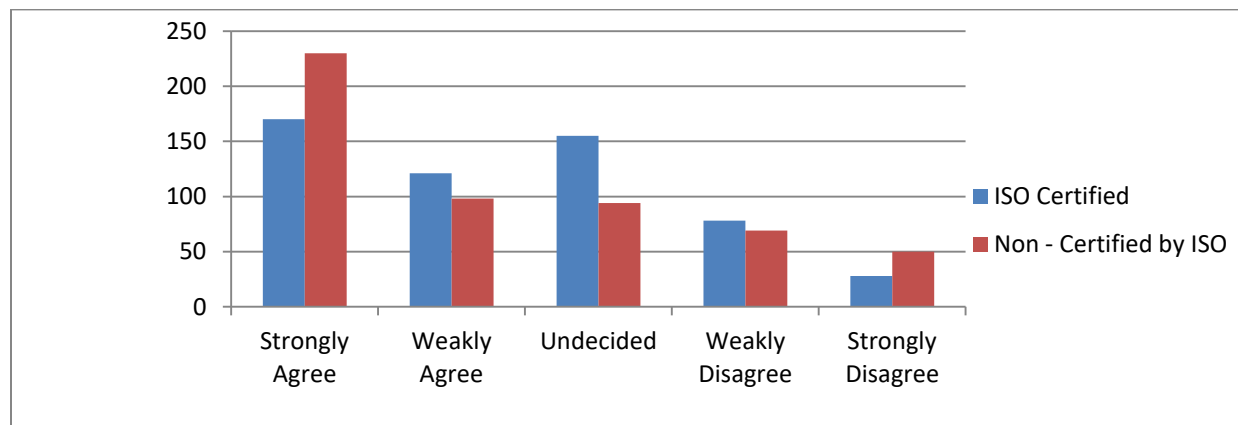
nearly less than tabulated value. Hence no difference among the two groups. Hence there is no difference in the improvements of overviewed and validated in case of both organizations.

**Table : 14 Responses on the systematic documentation of improvement and failures of the organisations with the same vigour**

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	170 (30.79)	121 (21.92)	155 (28.07)	78 (14.13)	28 (5.07)	552 (100)	3.59	1.44	1.20	0.029
Non – ISO Certified	230 (42.51)	98 (18.11)	94 (17.37)	69 (12.75)	50 (9.24)	541 (100)	3.71	1.86	1.36	

Note : Response percentages are shown in the brackets.

The figure represents the responses on the Systematic Documentation of improvement and failures of the organisations with the same vigour



**Figure : 7 Responses on the systematic documentation of improvement and failures of the organisations with the same vigour**

Table 14, Shows the responses on the systematic documentation of improvement and failures of the organisations with the same vigour. About 19 percent of respondents of ISO certified industries are disagree with this factor against the 27 percent response from Non - Certified industries. About 28 percent of respondents are undecided on this factor. Hence it is

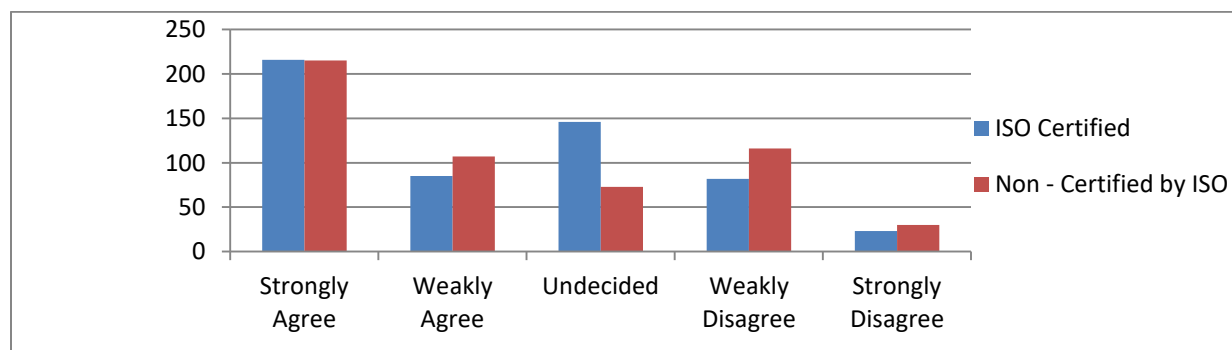
needed to check the response patterns of both the group's. The Chi - square test was conducted and the value found to be 43.68 which is little greater than the tabulated value for 4 degrees of freedom. Hence there exists a significant difference. The means of two groups are 3.59 for certified industries and 3.71 for non certified industries. The difference in the means are checked. The two tailed t-test was conducted and the value found to be more compared to the tabulated value. The ISO certified industries take a more effort in documentation for the improvements and failures occur rather than the non Certified industries.

**Table : 15**Response for awareness of cost of quality

Status	Strongly Agree	Weakly Agree	Undecided	Weakly Disagree	Strongly Disagree	Total	Mean	Variance	Standard Deviation	Sig 2-Tailed Test
ISO-Certified	216 (39.13)	85 (15.39)	146 (26.44)	82 (14.85)	23 (4.16)	552 (100)	3.70	1.54	1.24	0.721
Non - ISO Certified	215 (39.74)	107 (19.7)	73 (13.49)	116 (21.44)	30 (5.54)	541 (100)	3.66	1.78	1.33	

Note : Response percentages are shown in the brackets.

The figure represents the awareness of cost of quality



**Figure: 8** Response for awareness of cost of quality

Table 15, shows the response for Awareness of cost of quality. About 19 percent of respondents of ISO certified industries and 27 percent of respondents of Non - Certified industries are disagree the factor. They have no idea about the quality cost. About 26 percent of responses are undecided on this factor from ISO certified industries. Hence it is needed to check

the response patterns of both the group's. The Chi - square test was conducted and the value found to be 37.72 which is less greater than the tabulated value for 4 degrees of freedom. Hence there exists a significant difference. The means are 3.7 and 3.66 in case of ISO Certified and Non - Certified industries respectively. It is needed to check the difference in means of two groups. The two tailed t-test was conducted and the value found to be some what lesser to the tabulated value. Hence there exists no difference between the two groups. Employees are having the quality awareness in both groups of industries. It is needed to check for any relationship with the questions of same groups . The Correlation Matrix test was performed and it is shown in tables.

**Table : 16 Correlation test**

Variables	Overview & validated improvements	Balanced (Accurate) documentation	Cost of quality awareness
Improvement of effectiveness & efficiency.	0.312 (0.00)	0.315 (0.00)	0.310
Overview & validated improvements		0.335 (0.00)	0.150 (0.00)
Balanced (Accurate) documentation			0.289 (0.00)

**Note : p - values are given in the brackets.**

The Correlation matrix test was performed. The relation between the cost of quality awareness and accurate (balanced) documentation has the correlation value below + or - the 0.300, there exists a weak relationship between them and all other attributes values are more than + or - the 0.300 , they are having strong relationships. From the test it is also found that the Questions are not totally independent. It is needed to identify the common factors between the Questions of the same groups. Hence the Factor analysis test was performed. The Factor Analysis test results were shown in table.

**Table : 17 The test readings of the Factor analysis**

Attribute	F1	F2	F3	F4
Awareness About Improvement of Effectiveness and Efficiency”.	0.231	0.170	0.167	0.939
Review processes for improvement	0.049	0.971	0.154	0.145
Balanced or Accurate Documentation	0.120	0.160	0.955	0.151
Cost of quality awareness	0.961	0.049	0.120	0.215
Variance percentage	28.00	28.00	21.00	20.00

From the Factor analysis , it is observed that,

1. The factor F1 has very close relationship with the cost of quality awareness. The relation between other questions are weak. Therefore the factor named as “cost of quality awareness”.
2. The factor F2 has close relationship with the review processes for improvement”.  
 . There exists weak relationship with other questions. Hence the factor can be named as “Review processes for improvement”.
3. The factor F3 has closely related with the balanced or accurate documentation”.  
 . There exists a weak relationship with the other questions. The factor named as” Balanced or accurate documentation”.
4. The factor F4 has closely related with the awareness about improvement of effectiveness and efficiency”.

. There exists a weak relationship with the other questions. The factor named as “Awareness about improvement of effectiveness and efficiency”.

Variance of all the factors are almost same. The each question loaded with the single factor.

Continuous improvement mean scores shown in the table.

**Table: 18 Continuous Improvement Mean Scores.**

Type	Quality cost awareness F1	Review processes for improvements F2	Balanced or accurate documentation F3	Improvement awareness for effectiveness and efficiency F4	Continual improvement Overall Index
ISO Certified	3.70 (1.24)	3.82 (1.21)	3.59 (1.20)	3.77 (1.18)	3.72
Non - ISO Certified	3.66 (1.33)	3.65 (1.37)	3.71 (1.36)	3.45 (1.36)	3.61

In case of review processes for Improvements & Awareness in improvements of effectiveness and efficiency , no difference exists among the two groups.

In case of Cost of Quality Awareness and Balanced or Accurate Documentation, there exists much difference among the groups.

Hence the framed hypothesis states " Continual Improvement is good in case of ISO certified industries.

## 6. Hypothesis testing

The hypothesis were generated based on the responses of customers. The hypothesis are mainly concerns to the critical quality factors such are Commitment of Top Management, Involvement of Employees, Continual Improvement, Team Working, Customers Satisfaction and Internal and External Communications.

The hypothesis generated are as below

1. Employee Involvement is more in ISO adopted firms than the non adopted firms.

2. ISO Certified industries practice good Continual improvement techniques rather than the Non-ISO Certified industries.

**Hypothesis 1: Employee involvement is higher in case of ISO adopted industries rather than the non- ISO adopted industries.**

The main objective is to evaluate the employees involvement in both ISO certified and Non ISO certified industries.

The attributes of the employee involvement are as below

The quality factor employee involvement reflected in the following attributes and are

1. Framing of individual and team objectives
2. Innovative efforts promotion
3. Team effort for result evaluation and process management
4. Involvement of employees in the decision making and in objectives settings

The questions are assumed to be independent. The questions framed such that to represent the respective attributes. The responses were collected and analysed. The responses shows the level of different attributes. For arrive at conclusion, wheather the responses are of same pattern or not the chisquare test was conducted. By considering the values it was inferred that there exists a level difference between the two groups. There is a difference in the pattern. The correlation test was carried out and concluded that there exists some relationship between the Questions. In order to check the common factor in the Questions, the factor analysis test was performed. It is concluded that no level difference among the both groups for performance management and innovative initiative concerned. There is level difference exists between other factors . All the factors of both groups are almost same. Each questions loaded with the single factor. Overall index shows that there is a marginal difference exists. Marginally the ISO certified industries are having good employee involvement compared to the non -ISO Certified industries. Otherwise both are having same marginal values. The means are 3.74 for ISO adopted and 3.6 for the non ISO adopted firms. More number of employees are involved in the objective settings and in decision making process in the ISO certified industries rather than the non ISO certified industries. In the case of managing the performance and in creative initiatives, there is no level difference and the t- test value found to be 3.70 which is higher than the tabulated value 1.96 for 5% of significance level. As there is a small level difference between the groups. Hence the study hypotheses accepted.

**Hypothesis 2: ISO certified industries practice good Continual improvement techniques rather than the non ISO certified industries.**

The main objective is to assess the continual improvement in both the type of firms. The attributes of the continual improvement are as below



1. Improvement of effectiveness & efficiency.
2. Overview & validated improvements
3. Balanced (accurate) documentation
4. Cost of quality awareness

The questions are framed in such a way that they represent the respective attributes. The responses are collected on the five point likert scale. The responses shows the existence level of attributes in the both groups. The framed Questions are assumed to be independent. The Chisquare test was conducted to check the response patterns of the employees. From the test it was noted that there exists a level difference for 5% of significance level. Hence the responses are different from both the group's. To check the existence level of attributes the t- test was performed. It is needed to check the difference in means between the two groups. To know the relationship of the questions the correlation matrix test was conducted. It is concluded that there exists some relationship among the Questions. The common factors are identified by the factor analysis. Each questions are loaded with single factors. All the factors are having somewhat same variances. From the test it is observed that the each factor has relation with single Question. The means obtained are 3.43 and 3.34 for ISO certified industries and for non certified industries respectively. The overall index is marginally better for the ISO Certified industries than that of Non- Certified industries. There is only a significant difference between the two groups in upgradation of quality by improving the quality. There is no significant difference in the other factors. To accept or to reject the hypothesis, the t- test was performed. The t-test value found to be 2.03 which is more compared to the tabulated value. Hence there is a much difference among the groups. Hence the Study Hypotheses was accepted.

## 6.1 CONCLUSIONS

The Table 11, represents the means of Employee Involvement. It is concluded from the table that no difference found between the both the type of groups for performance management and innovative initiative concerned. There is a significant difference exists between other factors . Hence the framed hypothesis are " Higher level of employees involvement in the ISO certified industries than that of non ISO certified industries."

In case of review processes for Improvements & Awareness in improvements of effectiveness and efficiency , no difference exists among the two groups.

In case of Cost of Quality Awareness and Balanced or Accurate Documentation, there exists much difference among the groups.

Hence the framed hypothesis states " Continual Improvement is good in case of ISO certified industries". This statement is found to be true based on the hypothesis testing.

## 6.2 Future scope of the work

1. The study can be extended to the more industries of Karnataka and also to the another states and through out the India.
2. A study can be carried out to know how the industries are sustaining the quality from over a period of time.
3. Study can also be done by concentrating the patents and copyrights of a industries that are due to the efforts of creativity and innovations made.

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Survey questionnaires format

Name of employee:

Qualification:

Experience

Age:

Industry Name :

ISO certified or not :

S. No	Attributes	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree
1	We are associated with establishing team , individual goals and objectives					
2	The creative and innovative ideas, and efforts are emtertained and encouraged					
3	We are associated with the team work which assess the results, efficiency and productivity of construction.					
4	All the employers and employees of a construction industry in the same or other department are involved in framing the objectives and in case of decision making					