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CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	IMPACT OF INFORMATION SYSTEMS SUCCESS DIMENSIONS ON SYSTEMS EFFECTIVENESS: A CASE OF SUNPLUS ACCOUNTING PACKAGE WITHIN THE ZIMBABWE UNION CONFERENCE OF THE SEVENTH-DAY ADVENTIST CHURCH <i>DR. B. NGWENYA, R. CHISHIRI & F. NCUBE</i>	1
2.	CAPACITY BUILDING THROUGH INFORMATION TECHNOLOGY INITIATIVE IN ENVIRONMENTAL CONCERN OF UTTARAKHAND ENVIRONMENT PROTECTION AND POLLUTION CONTROL BOARD (UEPPCB) <i>AMIT DUMKA & DR. AJAY GAIROLA</i>	5
3.	STRESS MANAGEMENT IN PRESENT SCENARIO: A CHALLENGING TASK <i>ABHA SHARMA & DR. AJAY KUMAR TYAGI</i>	12
4.	CORPORATE SIZE AND CAPITAL STRUCTURE: AN EMPIRICAL ANALYSIS OF INDIAN PAPER INDUSTRY <i>DR. A. VIJAYAKUMAR & A. KARUNAIATHAL</i>	20
5.	APPLICATION OF KNOWLEDGE MANAGEMENT PRACTICES IN SMALL ENTERPRISES <i>T. S. RAVI</i>	25
6.	A STUDY ON CUSTOMER PREFERENCE AND ATTITUDE TOWARDS DATA CARD SERVICE PROVIDERS WITH REFERENCE TO COIMBATORE CITY <i>B. JANANI & T. M. HEMALATHA</i>	28
7.	THE SIGNIFICANCE OF EMPLOYEES TRAINING IN THE HOTEL INDUSTRY: A CASE STUDY <i>S. KALIST RAJA CROSS</i>	33
8.	A STUDY ON CUSTOMER SATISFACTION TOWARDS HEALTH DRINKS PRODUCTS (WITH SPECIAL REFERENCE TO COIMBATORE CITY) <i>S. HARIKARAN</i>	37
9.	DATA MINING PRACTICES: A STUDY PAPER <i>B. AYSHWARYA</i>	41
10.	ASSESSING THE ORTHOPEDICALLY HANDICAPPED CUSTOMERS' (OHC) ACCEPTANCE OF MOBILE BANKING ADOPTION THROUGH EXTENDED TECHNOLOGY ACCEPTANCE MODEL <i>UTHARAJA. K & VINOD KUMAR. G</i>	44
11.	A FINANCIAL ANALYSIS OF INDIAN AND FOREIGN STEEL INDUSTRIES: A COMPARISON <i>M. BENEDICT & DR. M. SINDHUJA</i>	48
12.	TRENDS OF FDI IN INDIA <i>DR. M. K. PANDEY & ANUMEHA PRIYADARSHNI</i>	52
13.	CURRENT e-CRM PRACTICES IN INDIAN PRIVATE SECTOR BANKS AND THE NEED FOR STRATEGIC APPROACH <i>WASEEM JOHN & SUHAIL JAVAID</i>	55
14.	SECURITY ISSUES IN e-COMMERCE <i>DR. SARITA MUNDRA, DR. SADHANA ZANZARI & ER. SURABHI MUNDRA</i>	60
15.	STUDY ON INVESTOR'S PERCEPTIONS TOWARDS ONLINE TRADING WITH REFERENCE TO MAYILADUTHURAI TOWN <i>DR. C. BALAJI</i>	64
16.	IMPACT OF DEBT CAPITAL ON OUTREACH AND EFFICIENCY OF MICROFINANCE INSTITUTIONS: A SURVEY OF SOME SELECTED MFIs IN TANZANIA <i>HARUNI MAPESA</i>	69
17.	RURAL CONSUMER ATTITUDE TOWARDS ONLINE SHOPPING: AN EMPIRICAL STUDY OF RURAL INDIA <i>MALLIKA A SHETTY</i>	74
18.	MICRO INSURANCE: A PRODUCT COMPARISON OF LIC & SBI LIFE INSURANCE <i>LIMNA .M</i>	79
19.	AN INTERDISCIPLINARY APPROACH TO EMPLOYABILITY IN INDIA <i>HARI G KRISHNA</i>	82
20.	AN OPINION-STUDY ABOUT 5-S PRACTICES TOWARDS IMPROVING QUALITY & SAFETY AND MAINTAINING SIMPLIFIED WORK ENVIRONMENT <i>K. BHAVANI SELVI</i>	87
	REQUEST FOR FEEDBACK & DISCLAIMER	91

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AN OPINION-STUDY ABOUT 5-S PRACTICES TOWARDS IMPROVING QUALITY & SAFETY AND MAINTAINING SIMPLIFIED WORK ENVIRONMENT

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ABSTRACT

Alvin Toffler identifies three stages of economic evolution- the Agrarian age, Industrial age and the Information age. At present we are in the information age commonly referred to as the information economy. Information technology and knowledge workers drive this information economy. Further, in the global business environment many new manufacturing approaches have emerged in achieving manufacturing excellence. In order to achieve this, the manufacturers of the present contemporary times adopt value-added manufacturing, continuous improvement manufacturing and JIT-Just-In-Time approaches. The continuous improvement manufacturing approach emphasises on improving the quality of goods and services involving the employees of all levels and functions of the organisation. The continuous improvement approach of manufacturing adopts quality planning, quality control, quality improvement, (JURAN TRILOGY) PDSA cycle (Plan, Do, Study and Act), 5S PRACTICES and Kaizen. Among them, this article attempts to study the effectiveness of 5-S practices in improving quality & safety and maintaining simplified work environment in the organisation that practises 5-S.

KEYWORDS

SEIRI (sorting), SEITON (arranging), SEISO (sweeping), SEIKETSU (standardising), SHITSUKE (discipline).

INTRODUCTION

Henry Ford was one of the pioneers in developing the idea of *Lean Manufacturing*. He maintained high production standards to fit together each stage of the production process in a perfect fashion with an ultimate intention to *reduce waste*. To implement this, he used the idea of “continuous flow” on the assembly line for his **MODEL-T** automobile manufacture. However, his process was not flexible and was a “push” process instead of a “pull” process led by consumer demand. As a result, it led to large inventories of unsold automobiles resulting in waste of money. Then **TAIICHI OHNO** of TOYOTA formulated the Toyota Production System (TPS) that used JIT (Just-In-Time) manufacturing methods to improve efficiency. Toyota successfully used this process to make the company become one of the most profitable manufacturing companies in the world. Lean Manufacturing technology identifies efficiencies in manufacturing and removes wasteful steps that do not add value to the final product. Waste reduction, however is not at the cost of reduced quality. To identify efficiencies, lean manufacturing focuses on customer-value. Customers want value and they will not pay for the defects in the product i.e., they shall not pay for the *waste*. *Waste* is anything that does not add value to the final product. In lean manufacturing, there are eight categories of waste – overproduction, waiting, inventory, transportation, over-processing, motion, defects and work force. TPS (Toyota Production System) involved the first seven categories of waste and called them as “MUDA” which means ‘waste’. Lean Manufacturing uses the eighth category “workforce”. Hence, lean manufacturing philosophy strongly believes that there is always existence of wastes, no matter how good the process is. Lean Manufacturing process has three stages. They are waste identification, waste analysis and finding the root cause of it and apply relevant tools to reduce waste. After identifying waste and analysing the root cause of it, the lean technology applies as a third step, a set of tools to reduce such wastes. The tools to reduce waste include Just-In-Time (JIT), Single Minute Exchange of Die (SMED) and the **5-S philosophy**. This article attempts to make an opinion-study about the 5-S practices in improving the quality of products and services of the organisation and providing safety and simplified work environment.

REVIEW OF LITERATURE

Womack & others (1990) in their book “The Machine that changed the World” discussed the significant performance gap between the Western and Japanese automotive industries. In the course of the exercise, they observed the reason for the superior performance of Japanese companies to be the adoption of “Lean Technology”. The term “Lean” denotes the use of less human efforts, capital investment, floor space, materials and time in all aspects of Japanese business methods of operations. **Ohno (1995)** recognises the term JIT (Just-In-Time) as the core idea of lean manufacturing based on the “pull” model. JIT model encourages purchase of materials that is required for production based on the orders received from the customers. JIT application makes the manufacturer produce small, continuous batches of products to help production run smoothly and efficiently. **Fredrick .W. Taylor** looked at individual workers and work methods. This resulted in time study and standardised work. He called his ideas Scientific Management. This theory was sound enough to apply science to management but failed to recognise behavioural sciences. **Frank Gilbert (1948)** in his *Ancestors of the Dozen added motion study and invented process charts*. These charts focussed attention on all work elements including *non-value added elements*. “The Psychology of Management: The Function of the Mind in Determining, Teaching, and Installing Methods of Least Waste” introduced psychology into the blend and studied how motivation and attitudes affect the outcome of a process. Therefore, there were many contributors, who originated the idea of ‘eliminating waste’- a key concept of JIT and Lean Manufacturing.

IMPORTANCE OF THE STUDY

The 5-S philosophy concentrates on simplifying the work environment, reducing waste and improving quality and safety. The five terms used to create a workplace suited for visual control and lean production. **SEIRI** means *sorting* denoting an action to identify and sort out all items necessary and unnecessary and then discard (clear) all the unnecessary items. **SEITON** means *arranging* everything in proper order for an easy retrieval. **SEISO** means *sweeping* the workplace thoroughly to make it dust-free. **SEIKETSU** means *standardising* i.e. maintaining a high standard workplace at all times. **SHITSUKE** means *self-discipline* especially with regard to safety rules and punctuality. The 5-S system is a systematic method for organising and standardising the workplace. This is one of the simplest lean tools to implement. It provides immediate return on investment crosses all boundaries and applies to all functions within the organisation. The benefits of lean manufacturing cannot succeed in a workplace that is disorganised, clumsy and dirty. Poor workplace conditions lead to wastes such as extra motion to avoid obstacles, time spent for searching things and delays due to defects, machine failures or accidents. Establishing basic workplace conditions becomes imperative in creating a manufacturing cell. For this purpose in many manufacturing companies, employee-teams use the **5S system** to improve and standardise workplace conditions for safe and effective operations. Therefore, 5S practice is a house keeping technique used to establish and maintain a productive and quality environment in an organisation which in turn boosts the morale of the employees, promoting a sense of belonging and pride in their work and responsibilities. The 5-S system creates a neat and clean workplace, systematises the day-to-day working, improve work efficiency, standardise work practices, improve work discipline, improve the product quality and work quality. Hence, this situation reveals the significance of study.

STATEMENT OF THE RESEARCH PROBLEM

The study of 5-S practices is a significant issue of research in the domain of *Lean Manufacturing* under *operations management* field of study. Many research contributions in this area show that 5-S system establish and maintain a productive and quality environment in an organisation. These contributions observed that adoption of 5-S system makes the workplace clean and better organised, generates more business, boosts the image of the company, makes office and

shop floor operations easier and safer, ensures employee-discipline, contribute to employee morale and productivity. These contributions also reveal that 5-S practice provide for better quality awareness, more usable floor space, low cost of production, better preventive maintenance, lesser accidents and high employee-involvement. Hence, it is an empirical challenge to observe whether 5-S practices improve the quality of workplace, provide safety at the workplace, and maintain simplified work environment. A large number of literature-review reveals the fact that 5-S practice is a house keeping technique to establish and maintain a well-organised workplace results in a safer, more efficient and more productive operation. The review identifies the fact- effective 5-S practices improve the quality and safety of the workplace and maintains a simplified work environment leading to a research question - whether 5-S practices improve the quality and safety of the workplace and create a simplified work environment. In order to find a solution, the researcher conducted a study in an automotive manufacturing company in Chennai to find the effectiveness of 5-S practices.

OBJECTIVES OF THE STUDY

The study has the following objectives:

- To understand the involvement of the employees towards 5-S practices
- To study the implementation of 5-S practices towards maintaining a productive and quality environment
- To study the effectiveness of 5-S implementation

HYPOTHESES

- There is no involvement of the employees towards 5-S practices
- The implementation of 5-S practices do not maintain a productive and quality work environment
- The 5-S implementations are not effective

METHODOLOGY

RESEARCH DESIGN

The research design is the blue print of a research and concerned with turning a research question into testing project. This study uses an empirical research design and involves both analytical and descriptive type of methodology. The study mainly depends on primary data.

STUDY AREA

Tiruvallur district is an administrative district in the South Indian state of Tamil Nadu. The town of Tiruvallur is the district headquarters. The district has a mixture of urban and rural characteristics. The Eastern part of Tiruvallur district is dominated by urban characteristics while the Southern and Northern part of the district has influence of Andhra culture due to its position. As of 2011, the district had a population of 3,728,104 with a sex ratio of 987 females for every 1,000 males. The district has been divided into three revenue divisions viz, Tiruvallur, Tiruttani and Ponneri. There are three taluks under Tiruvallur division, two taluks under Tiruttani divisions and four taluks under Ponneri division. There are 46 firkas and 820 revenue villages. Likewise, there are 14 blocks, 12 Municipalities and 13 town panchayats, which implement rural development activities. There are 178 Large and 21 Medium Scale Enterprises, 27319 Micro, and Small Enterprises engaged in the manufacturing of various products like Leather/Textiles/Chemical/Engineering. Some of the economic activities undertaken by the rural artisans are manufacturing of jute, coconut shell products, and palm leaf based products, paper cups, leather, rexin works etc.

SAMPLING SIZE AND DESIGN

The research study uses survey method to collect primary data. The survey method employs well-formulated questionnaire and applies multi-range sampling method for generating data. The study adopts a systematic method of selecting samples. The researcher distributed 120 questionnaires to the employees of a medium enterprise (the name of the company not mentioned in the article for the purposes of maintaining confidentiality) situated 40 kilometres away from Chennai in THIRUVALLUR district. It is an engineering company involving high technology dealing with the production of automotive parts. Out of 120 questionnaires, the researcher collected back 106 questionnaires. Out of these 106 questionnaires, 100 questionnaires were usable, rejecting the rest of them.

QUESTIONNAIRE DESIGN

The research study involved questionnaires as the instrument to collect primary data and divided into three parts. The respondents shared their opinions pertaining to the application and utility of 5-S practices. The first part of the questionnaire includes **demographic profile** with optional questions. The second part of the questionnaire uses optional questions relating to the **employees' opinion, employee-involvement and effectiveness of implementing 5-S practices** in the engineering unit selected for the study. The third part contains questions to understand the views of the employees pertaining to the **safety measures provided to them by adopting 5-S practices in the organisation** with Likert 5-point scale.

SCALING TECHNIQUE IN QUESTIONNAIRE

The questionnaire uses both optional type statements and statements in LIKERT 5-point scale. The response from the employees of the selected engineering company, rated in 5-point scale, as: 5- Strongly Agree 4 – Agree 3 – Neutral 2 – Disagree 1 – Strongly disagree

FRAMEWORK OF THE ANALYSIS

The following are the statistical tools used in the study:

1. **t-test** to ascertain the nature of responses of employees about various labour incentive schemes and significant differences among various factors of labour incentives and job satisfaction

RESULTS AND DISCUSSION

The researcher distributed the questionnaires to the employees of the organisation of the sample unit and collected the filled-in questionnaires from the respondents for analyses and interpretation. The summary of the results is analysed under three parts.

PART – I DEMOGRAPHY

Thirty percent of the employees of the sample unit lie in the age group 18-20 years followed by 63% in the age group of 21-30 years and 7% in the age group of 31-40 years. All the respondents of the sample unit are males (100%). Seventy five percent of the employees in the sample unit belong to the staff level while 25% belong to the executive level 88% of the employees in the sample unit are single and 12% of the employees are married. Forty seven percent of the respondents in the sample unit have higher secondary qualification and 4% have SSLC qualification while 25% of the employees are technically qualified and 24% of the respondents are graduates. Fifty four percent of the employees of the sample unit have 0-1 year experience and 33% of the employees have 2-3 years experience. Only 8% of the employees of sample unit have 4-5 years experience and 5% percentage of employees have > 6 years experience. Seventy percent of the employees of the sample unit get a gross salary ranging between RS 6500-7500 and 14% in the salary group RS 7501-10000 and 9% in the salary group between RS 10001-15000 and 7% in the salary group greater than RS 15000.

PART-II – EMPLOYEES' OPINION ABOUT 5-S PRACTICES, EMPLOYEE-INVOLVEMENT TOWARDS 5-S PRACTICES AND EFFECTIVENESS OF IMPLEMENTING 5-S PRACTICES

Ninety-three percent employees of the sample unit agree (out of which 59% strongly agree) that they are **aware** of the 5-S practices adhered to in the organisation. Twenty six percent of the employees of the sample unit strongly agree that they are **familiar** with the sorting out practices (**SEIRI**), 19% with systematic arrangement (**SEITON**), 13% with maintaining the place spic & span (**SEISO**), 21% with standardising (**SEIKETSU**) and 21% of the employees of the sample unit familiar with sustaining efforts through self-discipline (**SHITSUKE**). Ninety-five percent of the employees of the sample unit agree (out of which 67% strongly agree) that their organisation gives proper **training** for implementing 5-S practices. Ninety-two percent employees of the sample unit agree (out of which 48% strongly agree) that training for implementing 5-S practices provided by their organisation is quite helpful in understanding the job towards a better **performance**. Eighty-seven percent employees of the sample unit agree that (out of which 47% strongly agree) implementation of 5-S practices **reduces** the

work pressure largely. Ninety-two percent of the employees agree (out of which 46% strongly agree) that **awareness** about the implementation of 5-S program is necessary. Ninety percent employees in the sample unit agree (out of which 47% strongly agree) that the concept lying behind the implementation of 5-S program is easy to **understand** for its efficient implementation. Eighty-one percent employees of the sample unit agree (out of which 45% strongly agree) that the employees of the organisation show **voluntary involvement** in the implementation of the 5-S program. Eighty-four percent of the employees agree that the employees use **audit score sheet** on a regular basis towards implementing 5-S program. Eighty-five percent agree (out of which 38% strongly agree) that implementation of 5-S practices are quite effective. Eighty-eight percent employees of the sample unit agree (out of which 38% strongly agree) that 5-S practices, when adhered to, **improve strong relation** between physical environment at **work places**. 86% employees of the sample unit agree (out of which 45% strongly agree) that adopting 5-S practices implementation in organisations **improve work efficiency, quality and productivity**. Eighty-nine percent employees of the sample unit agree (out of which 57% strongly agree) that 5-S practices implementation **encourage** orderliness in organisations. Seventy-six percent employees of the sample unit agree (out of which 49% strongly agree) that by adopting 5-S practices implementation, the work place becomes **clean and better organised**. 86% percent employees of the sample unit agree (out of which 40% strongly agree) that production operations **become easier and safer** on adoption of 5-S practices implementation in organisations. Eighty-five percent employees of the sample unit (out of which 43% strongly agree) that 5-S practices, when implemented in organisations, **improve housekeeping, environmental performance, health and safety standards**. Eighty-three percent employees of the sample unit agree (out of which 37% strongly agree) that it is possible to **measure the progress** in implementing 5-S system in their organisation regularly. Ninety percent employees of the sample unit agree (out of which 42% strongly agree) that 5-S implementing program **creates knowledge** and **energises** employees with **zero-tolerance for dirt and disorder**. 86% employees of the sample unit agree (out of which 54% strongly agree) that management gets proper **feedback** from the employees about information pertaining to implementing 5-S practices. Twenty-one percent employees of the sample unit are of the **opinion** that 5-S system implementation helps in **waste reduction**, 15% employees are of the **opinion** that 5-S implementation practices helps in **understanding** the **duties and responsibilities easily**, 8% employees are of the **opinion** that 5-S practices help in **quick retrieval of documents**. 15% of the employees are of the **opinion** that 5-S practices, when adopted facilitates in maintaining a **clean and organised work place**, while 34% employees of the sample unit are of the **opinion** that 5-S practices implementation helps in **maintaining discipline** in work place. Seven percent of the employees of the sample unit are of the **opinion** that 5-S implementation system helps in **eliminating unwanted practices**.

PART-III- IMPLEMENTATION OF 5-S PRACTICES TOWARDS IMPROVING QUALITY & SAFETY AND MAINTAINING SIMPLIFIED WORK- ENVIRONMENT

Fifty nine percent of the respondents strongly agree that **5-S practice**, when adopted **promotes better living and improve work-life**. Fifty percent of the respondents strongly agree that 5-S practice help employees of the organisation to **undertake job responsibilities**. Fifty-four percent of the respondents strongly agree that **co-workers give tips to each other on how to work safely**. Forty-four percent of the respondents strongly agree that the organisations **encourage employees to report on unsafe conditions**. Forty-five percent of the respondents strongly agree that employees are quite clear about the responsibilities towards maintaining **health and a safety** work environment. Fifty percent of the respondents are of the opinion that workplace changes **promote self-confidence and self-discipline** among employees when the organisation adopts 5-S practices.

FINDINGS

The overall study reveals that the employees are aware of 5-S practices in their organisation and trained up in 5-S practices implementations. The training helps to understand the implementations of 5-S practices and helps them to perform the jobs better. 5-S practices reduce the employees' work burden. The employees are also of the notion that awareness about 5-S concept amongst employees is essential to implement 5-S practices effectively and the concept involved in 5-S practices implementation is easy to understand.

Further, the study also shows that the employees of the organisation consciously and voluntarily involve themselves in the implementation of 5-S practices and use **audit score** on a regular basis.

5-S implementation programs improve strong relation between physical environment at workplace and productivity in the organisation. It also improves the work efficiency and quality. It encourages orderliness in the organisation and helps maintaining the workplace clean and better organised.

The factory operations become easier and safer after adopting 5-S practices implementations in the organisation. It improves housekeeping, environmental performance health and safety standards in the organisation.

5-S practice, when adopted promotes better living and improves work life. 5-S practices help employees of the organisation to undertake job responsibilities. Co-workers give tips to each other on how to work safely. Organisations encourage employees to report on unsafe conditions. The employees are quite clear about the responsibilities towards maintaining healthy and a safety work environment. Employees are of the opinion that workplace changes promote self-confidence and self-discipline among employees when the organisation adopts 5-S practices.

SUGGESTIONS

All the employees of the country, nation-wide need training in the 5-S practices implementation towards a better operational performance for enhancing its productivity and work efficiency.

LIMITATIONS OF THE STUDY

Considering the time and cost factor the study is limited only to Chennai region. The study domain confines only to manufacturing companies and therefore the findings through analyses need not be the same for other industrial organisations. The study is only with reference to **ONE** selected manufacturing company in Chennai and does not include all the manufacturing companies located in Chennai. The study is limited only to 100 responses from the employees of manufacturing company in Chennai and hence the views of these respondents need not be the views of the employees of the entire manufacturing companies of the country. The researcher circulated questionnaires only to respondents who know to read and write. Thus the study confines its circulation of questionnaires only to literate group and ignores illiterate group who do not know to read and write.

CONCLUSION

The study suggests that the manufacturing companies, in order to enhance the level of productivity, must make the employees understand the concepts involved in 5-S practices and encourage them to practise the implementation of 5-S programs towards maintaining a productive and quality environment

SCOPE FOR FUTURE RESEARCH

The researcher, in this paper considers only the meaning and significance of the 5-S practices implementation and **how** to carry about its implementation is left as a topic in the agenda for future research.

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ANNEXURE

TABLE 1: RESPONDENTS' PERSONAL PROFILE

age	frequency	total
18-20	30	
21-30	63	
31-40	7	
41-50	0	100
gender		
male	100	
female	0	100
Marital status		
single	88	
married	12	100
education		
<SSLC	4	
PLUS 2	47	
DIPLOMA	25	
GRADUATE	24	
OTHERS	0	100
designation		
staff	75	
executive	25	100
experience		
0-1	54	
2 &3	33	
4 & 5	8	
>6	5	100
salary		
6500-7500	70	
7501-10000	14	
10001-15000	9	
>15000	7	100

Source: Primary data

TABLE 2: SUMMARY OF t – TEST

SL.NO	VARIABLES	MEAN	S.D	t - value	Standard error	sig
1	awareness	4.52	0.6242	24.35	.06242	0.00
2	training	4.60	0.6633	24.12	0.0663	0.00
3	performance	4.4	0.7163	19.13	0.0716	0.00
4	reduction	4.29	0.8282	15.58	0.0828	0.00
5	essential	4.36	0.6859	19.85	0.0685	0.00
6	Easy understanding	4.30	0.8660	15.01	0.0866	0.00
7	involvement	4.15	0.8874	12.97	0.0887	0.00
8	Voluntary involvement	4.18	0.9527	12.38	0.0953	0.00
9	audit	4.10	0.8888	12.39	0.0888	0.00
10	effectiveness	4.20	0.7746	15.48	0.0775	0.00
11	Physical environment	4.34	0.8028	16.69	0.0803	0.00
12	Improve productivity	4.28	0.7756	16.50	0.0776	0.00
13	orderliness	4.45	0.6712	21.61	0.0671	0.00
14	Clean & tidy	4.26	0.9552	13.19	0.0955	0.00
15	safety	4.17	0.9062	12.91	0.0906	0.00
16	housekeeping	4.17	0.9493	12.33	0.0949	0.00
17	Communication gap	4.13	1.0359	10.90	0.1036	0.00
18	Regular progress	4.09	0.9705	11.23	0.0971	0.00
19	Knowledge creation	4.22	0.9119	13.38	0.0912	0.00
20	feedback	4.31	0.9455	13.85	0.0946	0.00
21	Improved work life	4.39	0.9154	15.19	0.0915	0.00
22	Job responsibilities	4.39	0.7334	18.96	0.0733	0.00
23	Safety tips	4.38	0.8340	16.55	0.0834	0.00
24	Report unsafe	4.23	0.8349	14.73	0.0834	0.00
24	Health & safety	4.21	0.9622	12.86	0.0962	0.00
26	Self confidence	4.29	0.9622	13.41	0.0962	0.00
27	corrections	4.36	0.7003	19.42	0.0700	0.00
28	Managers involvement	4.44	0.7768	18.49	0.0778	0.00

Source: Primary data

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