INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT



A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories
Indexed & Listed at:

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., EBSCO Publishing, U.S.A., Cabell's Directories of Publishing Opportunities, U.S./ as well as in Open J-Gage, India [link of the same is duly available at Inflibnet of University Grants Commission (U.G.C.)]

Registered & Listed at: Index Copernicus Publishers Panel, Poland

Circulated all over the world & Google has verified that scholars of more than 1500 Cities in 141 countries/territories are visiting our journal on regular basis. Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	HIGH PERFORMANCE ORGANIZATION AND ORGANIZATIONAL EFFECTIVENESS IN BAPPEDA (DEVELOPMENT AND PLANNING BOARD), ACEH- INDONESIA	1
2 .	FIFI YUSMITA & DR. VIMALASANJEEVKUMAR SOCIAL ENTREPRENEURS IN BANGLADESH	7
3 .	DEWAN MAHBOOB HOSSAIN & MOINUL HOSSAIN IMPACT OF WORKING CAPITAL MANAGEMENT ON FIRM'S PERFORMANCE: EVIDENCES FROM LISTED COMPANIES OF INDIA	13
4.	DR. AVANISH KUMAR SHUKLA ENGLISH TEACHERS' EMOTIONAL INTELLIGENCE AND ITS IMPACT ON THEIR ORGANIZATIONAL CITIZENSHIP BEHAVIOUR IN SRI LANKAN SCHOOLS U.W.M.R. SAMPATH KAPPAGODA	18
5.	A QUALITATIVE INQUIRY OF LEADERSHIP PRACTICES AND ITS BEHAVIORAL AND PSYCHOLOGICAL OUTCOMES MADIHAREHMANFAROOQUI	23
6.	LINKING ORGANIZATIONAL CULTURE, STRUCTURE, AND ORGANIZATIONAL EFFECTIVENESS FAKHRADDIN MAROOFI, AFSHINGHASEMI & SAMIRA DHGHANI	29
7 .	SWOT ANALYSIS: AN INSTRUMENT FOR STRATEGIC PLANNING – A CASE STUDY GOMATESH M. RAVANAVAR & DR. POORNIMA M. CHARANTIMATH	35
8 .	THE ROLE OF HRM PRACTICES IN ORGANIZED RETAILING A STUDY OF SELECT RETAILERS IN BANGALORE CITY LAKSHMI NARAYANA.K, DR. P. PARAMASHIVAIAH & DR. SREENIVAS. D. L	41
9.	WATER CRISIS AT COAL CAPITAL OF INDIA: A PRAGMATIC STUDY OF ROOT CAUSES, IMPACT AND SOLUTION OF WATER CRISIS IN REGIONS OF WORKING COAL MINES OF BHARAT COKING COAL LIMITED DHANBAD ABHINAV KUMAR SHRIVASTAVA & DR. N. C. PAHARIYA	46
10 .	PORTFOLIO MANAGEMENT OF INDIAN MUTUAL FUNDS: A STUDY ON DIVERSIFIED EQUITY FUNDS PERFORMANCE E. UMA REDDY & C. MADHUSUDANA REDDY	50
11.	A STUDY OF DIFFERENCES IN PERCEPTION OF EMPLOYEES ABOUT THE HRD CLIMATE PREVAILS IN THE ENGINEERING INSTITUTE ON THE BASIS OF AGE GROUP MUKESH KUMAR PARASHAR & DR. MURLIDHAR PANGA	54
12 .	INSTITUTIONAL FINANCING OF AGRICULTURE IN INDIA WITH SPECIAL REFERENCE TO COMMERCIAL BANKS: PROBLEMS FACED BY FARMERS – AN EMPIRICAL STUDY DR. KEWAL KUMAR & ATUL GAMBHIR	58
13.	MULTIPLE FACETS OF ORGAN TRANSPLANTATION IN A TERTIARY CARE HOSPITAL MANAGEMENT, INDIA DR. PRAKASH.K.N, DR. CYNTHIA MENEZES, DR. ANNAPURNA RAMESH & S. HARISH BABU	61
14.	FDI, TRADE, AND ECONOMIC GROWTH IN SINGAPOREEVIDENCE FROM TIME-SERIES CAUSALITY ANALYSES DR. G. JAYACHANDRAN	66
15.	AN EVALUATION OF MICRO CREDIT IMPACT ON RURAL POOR WOMEN – A CASE STUDY IN BELLARY DISTRICT, KARNATAKA K. S. PRAKASHA RAO	77
16 .	APPRECIATION AND APPREHENSIONS OF INDIAN CORPORATE SECTOR ABOUT CORPORATE SOCIAL RESPONSIBILITY DR. B. M. HARSHAVARDHAN, DR. A. PRASAD & A V LAL	84
17.	SOCIAL MEDIA MARKETING: THE NEXT FRONTIER (AN EXPLORATORY STUDY ON SOCIAL MEDIA MARKETING PROSPECTIVE WITH REFERENCE TO PUNE CITY) GUNJN SINGH	92
18.	ROLE OF INFORMATION TECHNOLOGY IN AGRICULTURE AND AGRO-BASED INDUSTRIES DR. B. RAMACHNADRA REDDY, E. LAVANYA & P. HUSSAIN BASHA	97
19.	ADVENTURE TOURISM POTENTIAL: A STUDY OF KASHMIR FARHAT BANO BEG & DR. ASHOK AIMA	99
20 .	INVENTORY MODEL IN A FUZZY ENVIRONMENT WITH ITS ASSOCIATED COSTS IN EXPONENTIAL MEMBERSHIP FUNCTIONS K. PUNNIAKRISHNAN & K. KADAMBAVANAM	102
21.	EMPLOYEES PERSPECTIVE VIEW TOWARDS PERFORMANCE APPRAISAL AND TRAINING PROGRAMMES PRACTICED IN SUGAR INDUSTRIES IN ERODE DISTRICT M. SELVI SRIDEVI & DR. L. MANIVANNAN	107
22 .	INTEREST IN MANAGEMENT EDUCATION: THE CURRENT TREND AND ITS IMPLICATIONS VIJENDRA KUMAR S. K. & ANCY MATHEW	116
23.	IMPACT OF CORPORATE GOVERNANCE PRACTICES ON THE FIRM PERFORMANCE: AN EMPIRICAL EVIDENCE OF THE SMALL AND MEDIUM ENTERPRISES IN INDIA PARTHA SARATHI PATTNAYAK & DR. PRIYA RANJAN DASH	119
24.	A REVIEW OF HUMAN ERROR IN MAINTENANCE AND SAFETY ROSHAN KURUVILA	124
25.	SEARCH-EXPERIENCE FRAMEWORK: A CASE OF MOVIE INDUSTRY	127
26 .	T. SAI VIJAY & TANUSHREE GOSWAMI GENDER EQUALITY AND INCLUSIVE GROWTH: IN CASE OF PUNJAB DR. SANGEETA NAGAICH & PREETI SHARMA	132
27 .	ER. SANGEETA NAGAICH & PREETI SHARMA ESTIMATION OF POPULATION MEAN USING RANKED SET SAMPLING DR. SUNIL KUMAR, DR. SANDEEP BHOUGAL & RAHUL KUMAR SHARMA & DR. KULDIP RAJ	139
28 .	A GOAL PROGRAMMING FORMULATION IN NUTRIENT MANAGEMENT OF FERTILIZERS USED FOR RUBBER PLANTATION IN TRIPURA NABENDU SEN & MANISH NANDI	142
29 .	A STUDY ON THE FACTORS INFLUENCING INDIVIDUAL INVESTOR BEHAVIOR IN IT SECTOR SINDU KOPPA & SHALINI .P	145
30 .	RELIGION, LAW & THE ROLE OF STATE NITUJA KUMARI & MOHD YASIN WANI	150
·	REQUEST FOR FEEDBACK	154

CHIEF PATRON

PROF. K. K. AGGARWAL Chancellor, Lingaya's University, Delhi Founder Vice-Chancellor, Guru Gobind Singh Indraprastha University, Delhi Ex. Pro Vice-Chancellor, Guru Jambheshwar University, Hisar

FOUNDER PATRON

LATE SH. RAM BHAJAN AGGARWAL Former State Minister for Home & Tourism, Government of Haryana Former Vice-President, Dadri Education Society, Charkhi Dadri Former President, Chinar Syntex Ltd. (Textile Mills), Bhiwani

CO-ORDINATOR

AMITA Faculty, Government M. S., Mohali

<u>ADVISORS</u>

DR. PRIYA RANJAN TRIVEDI Chancellor, The Global Open University, Nagaland PROF. M. S. SENAM RAJU Director A. C. D., School of Management Studies, I.G.N.O.U., New Delhi PROF. M. N. SHARMA Chairman, M.B.A., Haryana College of Technology & Management, Kaithal PROF. S. L. MAHANDRU Principal (Retd.), Maharaja Agrasen College, Jagadhri

EDITOR

PROF. R. K. SHARMA Professor, Bharti Vidyapeeth University Institute of Management & Research, New Delhi

CO-EDITOR

DR. BHAVET Faculty, M. M. Institute of Management, Maharishi Markandeshwar University, Mullana, Ambala, Haryana

EDITORIAL ADVISORY BOARD

DR. RAJESH MODI Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia PROF. SANJIV MITTAL University School of Management Studies, Guru Gobind Singh I. P. University, Delh PROF. ANIL K. SAINI Chairperson (CRC), Guru Gobind Singh I. P. University, Delhi DR. SAMBHAVNA Faculty, I.I.T.M., Delhi DR. MOHENDER KUMAR GUPTA

Associate Professor, P. J. L. N. Government College, Faridabad

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT $_{\rm iii}$

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories WWW.ijrcm.org.in **DR. SHIVAKUMAR DEENE**

Asst. Professor, Dept. of Commerce, School of Business Studies, Central University of Karnataka, Gulbarga **MOHITA**

Faculty, Yamuna Institute of Engineering & Technology, Village Gadholi, P. O. Gadhola, Yamunanagar

ASSOCIATE EDITORS

PROF. NAWAB ALI KHAN Department of Commerce, Aligarh Muslim University, Aligarh, U.P.

PROF. ABHAY BANSAL

Head, Department of Information Technology, Amity School of Engineering & Technology, Amity University, Noida

PROF. A. SURYANARAYANA

Department of Business Management, Osmania University, Hyderabad

DR. SAMBHAV GARG

Faculty, M. M. Institute of Management, Maharishi Markandeshwar University, Mullana, Ambala, Haryana

PROF. V. SELVAM

SSL, VIT University, Vellore

DR. PARDEEP AHLAWAT

Associate Professor, Institute of Management Studies & Research, Maharshi Dayanand University, Rohtak **DR. S. TABASSUM SULTANA**

Associate Professor, Department of Business Management, Matrusri Institute of P.G. Studies, Hyderabad **SURJEET SINGH**

Asst. Professor, Department of Computer Science, G. M. N. (P.G.) College, Ambala Cantt.

TECHNICAL ADVISOR

ΔΜΙΤΔ Faculty, Government H. S., Mohali **MOHITA**

Faculty, Yamuna Institute of Engineering & Technology, Village Gadholi, P. O. Gadhola, Yamunanagar

FINANCIAL ADVISORS

DICKIN GOYAL Advocate & Tax Adviser, Panchkula **NEENA** Investment Consultant, Chambaghat, Solan, Himachal Pradesh

LEGAL ADVISORS

JITENDER S. CHAHAL Advocate, Punjab & Haryana High Court, Chandigarh U.T. **CHANDER BHUSHAN SHARMA** Advocate & Consultant, District Courts, Yamunanagar at Jagadhri



SUPERINTENDENT

SURFNDER KUMAR POONIA

DATED:

' for possible publication in your journals.

CALL FOR MANUSCRIPTS

We invite unpublished novel, original, empirical and high quality research work pertaining to recent developments & practices in the area of Computer, Business, Finance, Marketing, Human Resource Management, General Management, Banking, Insurance, Corporate Governance and emerging paradigms in allied subjects like Accounting Education; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Monetary Policy; Portfolio & Security Analysis; Public Policy Economics; Real Estate; Regional Economics; Tax Accounting; Advertising & Promotion Management; Business Education; Management Information Systems (MIS); Business Law, Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labor Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; Public Administration; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism, Hospitality & Leisure; Transportation/Physical Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Digital Logic; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Multimedia; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic and Web Design. The above mentioned tracks are only indicative, and not exhaustive.

Anybody can submit the soft copy of his/her manuscript **anytime** in M.S. Word format after preparing the same as per our submission guidelines duly available on our website under the heading guidelines for submission, at the email address: <u>infoijrcm@gmail.com</u>.

GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. COVERING LETTER FOR SUBMISSION:

THE EDITOR IJRCM

JICIVI

Subject: SUBMISSION OF MANUSCRIPT IN THE AREA OF

(e.g. Finance/Marketing/HRM/General Management/Economics/Psychology/Law/Computer/IT/Engineering/Mathematics/other, please specify)

DEAR SIR/MADAM

Please find my submission of manuscript entitled '

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published elsewhere in any language fully or partly, nor is it under review for publication elsewhere.

I affirm that all the author (s) have seen and agreed to the submitted version of the manuscript and their inclusion of name (s) as co-author (s).

Also, if my/our manuscript is accepted, I/We agree to comply with the formalities as given on the website of the journal & you are free to publish our contribution in any of your journals.

NAME OF CORRESPONDING AUTHOR:

Designation: Affiliation with full address, contact numbers & Pin Code: Residential address with Pin Code: Mobile Number (s): Landline Number (s): E-mail Address: Alternate E-mail Address:

NOTES:

- a) The whole manuscript is required to be in **ONE MS WORD FILE** only (pdf. version is liable to be rejected without any consideration), which will start from the covering letter, inside the manuscript.
- b) The sender is required to mention the following in the SUBJECT COLUMN of the mail: New Manuscript for Review in the area of (Finance/Marketing/HRM/General Management/Economics/Psychology/Law/Computer/IT/ Engineering/Mathematics/other, please specify)
- c) There is no need to give any text in the body of mail, except the cases where the author wishes to give any specific message w.r.t. to the manuscript.
- d) The total size of the file containing the manuscript is required to be below **500 KB**.
- e) Abstract alone will not be considered for review, and the author is required to submit the complete manuscript in the first instance.
- f) The journal gives acknowledgement w.r.t. the receipt of every email and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of manuscript, within two days of submission, the corresponding author is required to demand for the same by sending separate mail to the journal.
- 2. MANUSCRIPT TITLE: The title of the paper should be in a 12 point Calibri Font. It should be bold typed, centered and fully capitalised.
- 3. AUTHOR NAME (S) & AFFILIATIONS: The author (s) full name, designation, affiliation (s), address, mobile/landline numbers, and email/alternate email address should be in italic & 11-point Calibri Font. It must be centered underneath the title.
- 4. **ABSTRACT**: Abstract should be in fully italicized text, not exceeding 250 words. The abstract must be informative and explain the background, aims, methods, results & conclusion in a single para. Abbreviations must be mentioned in full.

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

- 5. **KEYWORDS:** Abstract must be followed by a list of keywords, subject to the maximum of five. These should be arranged in alphabetic order separated by commas and full stops at the end.
- 6. MANUSCRIPT: Manuscript must be in <u>BRITISH ENGLISH</u> prepared on a standard A4 size <u>PORTRAIT SETTING PAPER</u>. It must be prepared on a single space and single column with 1" margin set for top, bottom, left and right. It should be typed in 8 point Calibri Font with page numbers at the bottom and centre of every page. It should be free from grammatical, spelling and punctuation errors and must be thoroughly edited.
- 7. **HEADINGS**: All the headings should be in a 10 point Calibri Font. These must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.
- 8. SUB-HEADINGS: All the sub-headings should be in a 8 point Calibri Font. These must be bold-faced, aligned left and fully capitalised.
- 9. MAIN TEXT: The main text should follow the following sequence:

INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

INDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENT

REFERENCES

APPENDIX/ANNEXURE

It should be in a 8 point Calibri Font, single spaced and justified. The manuscript should preferably not exceed 5000 WORDS.

- 10. FIGURES & TABLES: These should be simple, crystal clear, centered, separately numbered & self explained, and titles must be above the table/figure. Sources of data should be mentioned below the table/figure. It should be ensured that the tables/figures are referred to from the main text.
- 11. EQUATIONS: These should be consecutively numbered in parentheses, horizontally centered with equation number placed at the right.
- 12. **REFERENCES:** The list of all references should be alphabetically arranged. The author (s) should mention only the actually utilised references in the preparation of manuscript and they are supposed to follow **Harvard Style of Referencing**. The author (s) are supposed to follow the references as per the following:
- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
- Use (ed.) for one editor, and (ed.s) for multiple editors.
- When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc, in chronologically ascending order.
- Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
- The title of books and journals should be in italics. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
- For titles in a language other than English, provide an English translation in parentheses.
- The location of endnotes within the text should be indicated by superscript numbers.

PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:

BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

CONTRIBUTIONS TO BOOKS

 Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

OURNAL AND OTHER ARTICLES

 Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

 Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

• Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

ONLINE RESOURCES

Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

A REVIEW OF HUMAN ERROR IN MAINTENANCE AND SAFETY

ROSHAN KURUVILA ASST. PROFESSOR DEPARTMENT OF MECHANICAL ENGINEERING AMALJYOTHI COLLEGE OF ENGINEERING KOOVAPALLY

ABSTRACT

Industrial safety mainly depends on the performance of equipments and operations of the organization. The performance of the equipment and operations are highly dependent on the maintenance activity. The maintenance activity is heavily reliant on humans. Various studies have proved that human error is a major factor for the premature failure of equipments after the maintenance activities has been performed on them. The role of humans in maintenance has received much importance; recently more attention has been towards reducing human error in maintenance and inspection. Maintenance and inspection tasks are an inevitable part of an organization, where individuals perform varied tasks in a non conducive environment and difficult ambient conditions. These situational characteristics, in combination with generic human behaviors, results in error and leads to accidents. This also impede productivity and efficiency of the operations. As the maintenance quality is largely dependent on the conditions of the maintenance staff. These conditions, along with many others, which are called human factors will lead directly lead to failures. Even though it is never possible to eliminate human error totally, it is possible to reduce these errors through a good maintenance management. This paper overviews the various constituents of human factors that affect maintenance and analyzes various methodologies which can be used to reduce errors and thereby improve safety, reliability and availability of the organization. This paper also reviews current strategies in identifying, and managing human error in maintenance and inspection for a better industrial safety.

KEYWORDS

Human factors, Inspection, Maintenance, Safety.

INTRODUCTION

s Industrial safety is heavily depended on maintenance. If it is not performed correctly, it will lead to an accidents and incidents. Major maintenance errors are incorrectly installed parts, missing parts, and not performing the necessary checks. In contrast to many other threats to safety, the errors made by a maintenance people are very difficult to identify. Many times, these mistakes are present but not able identify easily and will remain latent, affecting the safe operation of the equipment. Maintenance staffs are confronted with lot of unique human factors within the organization. Often times, they are working in the unpleasant hours, in a limited space, and unergonomic postures, and in adverse environmental conditions. The work can be physically challenging, and it also requires more attention. Because of the unique nature of the maintenance tasks, usually maintenance staffs spend more time in preparing for the task rather than actually performing it. The key element is the correct documentation of all maintenance activities, and they spend much time updating maintenance details as they are performing the work. The awareness of various Human factors will lead to quality improvement; the presence of a conducive environment ensures worker safety, and lead to more involvement and responsibility. More specifically, the reduction of errors can provide a large quantity of benefits including reduced cost, avoiding delays, reduction in injuries, reduction of customer services, and reduction significant events because of maintenance error. The aspects of human errors are discussed in relation to maintenance. The most and the best advantage is that the introduction of ways to mitigate the risk and to stop them from developing into a problem.

EVOLUTION OF MAINTENANCE HUMAN FACTORS

By the end of the of World War I (1914–1918), more and more sophisticated equipment was being developed because of the non availability of competent personals to use such systems and the increased level in human expectation . Till this time, the focus was on the humans, but as the time progressed, the focus gradually shifted onto the design of equipments in connection with environmental factors. The major consequence of the war was the introduction of need for research and Development. The other major development was the identification of the Hawthorne Effect, which suggested that motivational factors could significantly influence human performance. By the end of World War II (1939–1945), it was difficult to match the existing individuals to preexisting jobs. By The time design of equipment had shifted its focus into human factors and also to take advantage of human capabilities. On this there was a large number of researches where performed to determine the human capabilities and limitations. The study done by Fitts and Jones, in 1947 on the most effective configuration of control knobs .Much of this research transcended into other equipment with the aim of making the controls and displays easier for the operators to use. The beginning of the Cold War led to a major expansion of these and large number research laboratories were set, and the aim of the researches was to design small equipments. The scope of the research also broadened from small equipment to entire workstations and systems. In the industry, the focus gradually shifted from research to participation through engineers by advice to in the design of equipment. **H**

HUMAN ERROR

To understand the role of human error in an accident or incident is different from simply attributing such an event to an fallible human. Human error has been differently characterized as: any member of a set of human actions that exceeds some limit of acceptability (Swain and Guttman, 1983), any human action or inaction that exceeds the tolerances defined by the system with which the human interacts (Lorenzo, 1990), the failure to achieve an intended outcome beyond the influence of random occurrence (Reason, 1990), a necessary outcome to allow humans to explore and understand systems (Rasmussen, 1990; Reason, 1990), and derivative of operators' social experience of responsibility and values (Taylor, 1987). These definitions convey the complex nature of human error. However, they suggest that: humans behaviors are tolerant to the elements of a system, and also that human error is a term for normal human behavior in an unpleasant environments,. These observations are also reflected in the two major approaches developed to address human error in accident and incident analyses: human reliability assessment (HRA) and human error classifications (Kirwan, 1992a). Summarized below, HRA methods and human error classifications are more fully reviewed and contrasted by [Kirwan, 1992a] and [Kirwan, 1992b].

HUMAN ERROR IN MAINTENANCE

The simple explanations do not convey the complexity of the system. Most of the equipments in the systems are becoming increasingly technologically complex. New methods for inspecting and diagnosing these systems are increasingly needed Further, inspecting and maintaining machineries is organizationally complex; emerging from a socio-technic process in which hundreds, even thousands, of people are directly involved (Taylor, 1990). These conditions will result in a work environment that is not conducive for the humans to work. Moreover simultaneous efforts to accomplish the competing goals of industrial safety, time pressures. The economic pressures may motivate operators to violate the inspection/maintenance practices. Consequences of errors are not immediately obvious (Graeber and Marx, 1993). The Delay in feedback reduces the ability of operators to learn from errors. Such delays also lead to delay in accident investigation because situational factors surrounding the errors are lost. In addition, because different types of maintenance problems present themselves randomly to individual operators, it is difficult for any one operator to identify what may be a systematic problem in an equipment type or mechanism (cf. Inaba

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT 124

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

VOLUME NO. 2 (2012), ISSUE NO. 9 (SEPTEMBER)

and Dey, 1991). Maintenance often lasts for shifts and days, making coordination of activities and communication among different operators very difficult. Quality control audits and inspections and error reporting systems obtain data on inspection and repair performance. However they do not provide accurate feedback to operators on errors. Further, feedback during training for inspection tends to focus on procedural aspects of the task rather than providing feedback for other, more cognitive, aspects of the inspection task (Prabhu and Drury, 1992).by observing these complexities, it is not surprising that humans in this system make errors. Maintenance and inspection errors can be explained in terms of their most immediate and observable effect on equipment, ultimate effects on equipments and secondary effects on the industry. The various types of errors in maintenance and inspection are explained as failures of the tasks involved. The incidence and forms of maintenance and inspection human errors can be explained by these factors..

EFFECTS OF MAINTENANCE ERROR ON EQUIPMENT

Several studies have identified the most common, immediate effects of human error in maintenance. A major study shows that distribution of 122 maintenance errors over a period of years are: omissions (56%), incorrect installations (30%), and wrong parts (8%), other (6%) (Graeber and Marx, 1993).Data collected from industry (Prabhu and Drury, 1992) revealed several major categories of human errors in maintenance and inspection tasks, are: Defective component ,missing component , wrong component , incorrect configuration, incorrect assembly sequence , functional defects , tactile defects , procedural defects .

GUIDELINES FOR REDUCING HUMAN ERROR IN MAINTENANCE

According to the various studies conducted over the years various methods has been developed to reduce human error in maintenance. This paper examines some guidelines which can be used to reduce human error in maintenance. Many of these guidelines can also be used in other areas of maintenance. The guidelines cover the areas of procedures, risk management, tools and equipment, training, design, communication, and maintenance feedback. By ensuring the following this procedural errors can be minimized:

Perform the work in the standard ways, Periodic and routine check ups are to be administered in accordance with the standard procedures. Adequate control methods to ensure that the check ups are more effectively done. The check list must ensure that it serves the objectives. The other things that are to be noted while ensuring the safety are: the routine checkups and other things are to be administered without disturbing the normal working practices because the disturbances are one of the probabable sources of error. The adequacy of methods of detecting maintenance errors is to be critically evaluated, make sure that the systems is not checking simultaneously the same maintenance task in a similar redundant system.

The importance of supervision is to be strengthened, particularly in the late hours of each shift as the chances of occurrence of are more. Make sure that there is a proper way of communication to ensure that important information to all maintenance staff are shared without delay information's such as changing procedures or methods to control errors in an effective manner. The other important area of communication is time of shift handovers, as the transfer of incomplete tasks across shifts are another possible source of error.

ADDRESSING HUMAN ERROR IN MAINTENANCE AND INSPECTION

As one determines that human error is a factor in an error, or error-likely situation, we must know how to control, or manage, these errors. Most of the situations can be explained through a variety of interventions as suggested by Rouse. Further, interventions are most effectively implemented when used in combination. Interventions for error reduction include: selection, training, equipment design, job design, and aiding (Rouse, 1985). More detailed lists of interventions specifically intended for the maintenance and inspection environment have been classified as short term and long-term interventions (Shepherd et al., 1991). This paper reviews some of the methods proposed by different studies in the reduction of error. This review considers the effects of: training, equipment design considerations, working environment, communication, and automation. At last we try to describe an approach to identifying, selecting among, and justifying intervention strategies for managing errors in maintenance and inspection.

TRAINING

According to HSE (HSG 48:1999) Human error is inevitable, everyone makes mistakes how well they are trained and motivated Prabhu and Dury (1992) explains the importance of Training at the individual level will improve ability of the worker to take advantage of new tools and methodologies. For example, inspection training tends to focus on procedural aspects rather than providing feedback for other, more cognitive aspects (Prabhu and Drury, 1992) However researches have proved that there are still opportunities for improving individual training and there by reducing the errors. Thus the safety can be ensured in the organization

EQUIPMENT DESIGN CONSIDERATIONS

Humans are prone to errors (James Reason and Allan Hobbs,2003) As the complexity of equipments increase the skill and knowledge of the operator has to be increased. The maintenance staff requires more attention for performing the maintenance tasks. The various researches have established that Attention is key element in human error. By human nature humans cannot have the attention for longer period because which will result in stresses. Further Reason and Hobbs explains that attention is an extremely limited quantity and we can only attend to very small proportion of our sensory data and the ability to capture of unwanted data is very large. Correct performance of the operator to complex equipment requires right balance of attention which is very difficult. So if we have a simple user friendly design the chances of failure are less and proper safety can be assured.

WORKING ENVIRONMENT DESIGN

As stated earlier maintenance activity is a human related performance .Humans are prone to errors, According to James Reason we cannot change the human nature but we can change the conditions in which they work.(Reason J:2000) The various aspects of the environment affect maintenance performance in a great way. Almost all the maintenance tasks are performed in extremely severe conditions. Marry researches have found that chances of making error in an adverse condition are more compared to that of in good environment. Researches has proved that improper space, lighting extra can severally affect the performance of the staff Good working environment will help the maintenance staff in decision making and controlling which will result in reduction of error Research has most fully addressed issues of lighting adequacy and postural/biomechanic hazards associated with aviation maintenance and inspection tasks. Ninety percent of all inspection is visual inspection (Johnson and Shepherd, 1993).

A good and properly designed environment in coordination with the system will improve the safety of the organization.

COMMUNICATION

Most of the "human errors" in maintenance and inspection are the results of poor interfaces to equipment and information. Therefore, the most important thing is to implement methods for controlling these errors is to redesign equipment and the staff interfaces. The chances of making a wrong decision can be minimized by sharing the correct information to the staff at the right time. Industrial maintenance and inspection tasks are increasingly computer based and include the use of new tools and techniques. As such, the human/machine interface to computer-based systems and new equipment is increasingly important. In general, designing these interfaces would benefit from usability assessment and engineering (Ravden and Johnson, 1989; Nielsen, 1993). A well designed communication channel in accordance with system will reduce the chances of occurrence of error thereby ensuring the safety of the organization.

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

AUTOMATION

Eventhogh the entire maintenance operations cannot be automated, some automation will appear useful. The development of these has typically been technology driven, rather than human-centered and requirements driven. This approach has resulted in the development of automation systems that are not well integrated (Drury, 1996). The automation approaches to maintenance and inspection by function (Drury, 1996). Drury emphasizes the importance of considering the additional training requirements of automation interventions and sensitively incorporating automation into the organizational context and individuals' jobs will result in the reduction of errors there by increasing the safety of the organization.

ERROR MANANGEMENT

Along with managing human error in maintenance, we must manage interventions also. For the growth of the organization more and more interventions are required. The system should try incorporating various schemes and methods to employees to generate potential alternative strategies (Drury et al. 1996) the prototype system (PERS) proposed by C.G. Dury describes a system for a more comprehensive approach to error reduction and management. This system begins with the assumption that pro-active error monitoring and reactive error reporting are both essential for effective error control. It is based on the premise that it is important to identify and organize error reporting information in a manner consistent with intervention strategies. The proposed system has five modules: (1) error reporting, (2) critical incident reporting (reports of situations where errors/incidents almost happened but were recovered without consequences), (3) error audit (auditing specific tasks to find human-system mismatches), (4) error assessment (anonymous assessment of the task environment by technicians and management), and (5) solutions database (of information from industry sources and human factors experts for design changes). This prototype system is called PERS (Pro-active Error Reduction System). This can be implemented for the risk management in an organization for minimizing the consequences of error.

CONCLUSION

The very existence of the industry is depended on the contribution of maintenance personnel, yet maintenance error is a significant and continuing threat to safety. Earlier days, maintenance errors were often viewed as nothing more than failures of individuals to perform their assigned tasks, and organizations often responded with punishment or dismissal. Recent studies conducted by S Dunn reveals that traditional approaches are not effective in dealing with the human errors and now the world has accepted that human errors are the consequences of personal matters, workplace, and organizational factors. Even now maintenance personals must still take responsibility for their actions, and the threat of maintenance error.

The industrial approach to maintenance error involves, the probability of reducing maintenance error by identifying and controlling the error-producing conditions in the organization. This involves attention to human factors training, the provision of appropriate tooling and equipment, and other actions directed at the human factors associated with maintenance error. And further to accept that maintenance error is a threat to safety and that is to be reduced. Industries must learn to manage the inevitable threat of maintenance error in the same way they deal with natural hazards such as weather. The human error in the organization can be minimized by ensuring that appropriate risk controls methods are there to identify and correct errors, and minimize the consequences of those errors that remain unidentified, despite the best efforts of the organization. By considering the above discussed points along with and properly designed system in accordance with the organization can reduce the possible threat to industrial safety.

REFERENCES

- 1. Allen Jr., J.P., Rankin, W.L., 1995. A summary of the use and impact of the Maintenance Error Decision Aid (MEDA) on the commercial aviation industry. In: Proceedings of the Flight Safety Foundation International Federation of Airworthiness 48th Annual International Air Safety Seminar. Flight Safety Foundation, Arlington, VA, pp. 359369.
- 2. Drury, C.G., 2000. Relative advantages of portable computer based work cards for aircraft inspection. International Journal of Industrial Ergonomics 3(1), in press
- 3. Drury, C.G., 1996. Automation in quality control and maintenance. In: Parasuraman, R., Mouloua, M. (Eds.), Automation and Human Performance: Theory and Applications. Lawrence Erlbaum Associates, Mahwah, NJ, pp. 407)426.
- 4. Drury, C.G., Prabhu, P., Gramopadhye, A., 1990. Task analysis of aircraft inspection activities: methods and findings. In: Proceedings of the Human Factors 34th Annual Meeting. Human Factors and Ergonomics Society, Santa Monica, CA, pp. 1181}1185.
- 5. Edwards, E., 1972. Man and machine: systems for safety. In: Proceedings of British Airline Pilots Association Technical Symposium. British Airline Pilots Association, London, pp. 21}36.
- 6. Graeber, R.C., Marx, D.A., 1993. Reducing human error in aircraft maintenance operations. In: Proceedings of the Flight Safety Foundation International Federation of Airworthiness 46th Annual International Air Safety Seminar. Flight Safety Foundation, Arlington, VA, pp. 147}160.
- 7. Inaba, K., Dey, M., 1991. Programmatic Root Cause Analysis of Maintenance Personnel Performance Problems. U.S. Nuclear Regulatory Commission, Washington, DC
- 8. Johnson, W.B., 1989. Research and development. In: Proceedings of the Second Annual International Conference on Aging Aircraft. Federal Aviation Administration, Washington, DC, pp. 30}35.
- 9. Johnson, W.B., Shepherd, W.T., 1993. The impact of human factors research on commercial aircraft maintenance and inspection. In: Proceedings from the Flight Safety Foundation 46th Annual International Air Safety Seminar. Flight Safety Foundation, Arlington, VA, pp. 187}200.
- 10. Kirwan, B., 1992a. Human error identification in human reliability assessment. Part 1: overview of approaches. Applied Ergonomics 23 (5), 299}318.
- 11. Kirwan, B., 1992b. Human error identification in human reliability assessment. Part detailed comparison of techniques. Applied Ergonomics 23 (6), 371}381.
- 12. Latorella, K.A., Gramopadhye, A.K., Prabhu, P.V., Drury, C.G., Smith, M.A., Shanahan, D.E., 1992. Computer-simulated aircraft Inspection tasks for ol-line experimentation. In: Proceedings of the Human Factors Society 36th Annual Meeting. Human Factors and Ergonomics Society, Santa Monica, CA, pp. 92]96.
- 13. Lorenzo, D., 1990. A Manager's Guide to Reducing Human Errors: Improving Human Performance in the Chemical Industry. Chemical Manufacturers Association, Washington, DC.
- 14. Mason, S., 1990. Improving plant and machinery maintainability. Applied Ergonomics 3, 15}24.
- 15. Nielsen, J., 1993. Usability Engineering. Academic Press, Cambridge MA.
- 16. Prabhu, P., Drury, C.G., 1992. A framework for the design of the aircraft inspection information environment. In: Proceedings of the Seventh FAA Meeting on Human Factors Issues in Aircraft Maintenance and Inspection. Federal Aviation Administration, Washington, DC.
- 17. Rasmussen, J., 1990. The role of error in organizing behavior. Ergonomics 33 (10/11), 1185}1199.
- 18. Rasmussen, J., 1985. Trends in human reliability analysis. Ergonomics 28 (8), 185}1195.
- 19. Ravden, S.J., Johnson, G.I., 1989. Evaluating Usability of Human- Computer Interfaces: A Practical Method. Hallstead Press, New York.
- 20. Reason, J., 1990. Human Error. Cambridge University Press, New York.
- 21. Reason, J., 1987. Collective planning and its failures. In: Rasmussen, J., Duncan, K., LePlat, J. (Eds.), New Technology and Human Error. Wiley, New York.
- 22. Rouse, W.B., 1985. Optimal allocation of system development resources and/or tolerate human error. IEEE Transactions on Systems, Man and Cybernetics 15 (5), 620}630.
- 23. Rouse, W.B., Rouse, S.H., 1983. Analysis and classification of human error. IEEE Transactions on Systems, Man and Cybernetics 13 (4), 539)549.
- 24. Shepherd, W.T., Johnson, W.B., Drury, C.D., Taylor, J.C.,Berninger, D., 1991. Human Factors in Aviation Maintenance, Phase 1: Progress Report: DOT/FAA/AM-91/16. National Technical Information Service, Springfield, VA.
- 25. Swain, A., Guttman, H. 1983. Handbook of Human Reliability Analysis with Emphasis on Nuclear Poser Plan Applications: Final Report (NUREG/CR-1278). United States Nuclear Regulatory Commission, Washington, DC.
- 26. Taylor, D.H., 1987. The hermeneutics of accidents and safety. In: Rasmussen, J., Duncan, K., LePlat, J. (Eds.), New Technology and Human Error. Wiley, New York, NY.

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

REQUEST FOR FEEDBACK

Dear Readers

At the very outset, International Journal of Research in Commerce, IT and Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue as well as on the journal as a whole, on our E-mail i.e. **infoijrcm@gmail.com** for further improvements in the interest of research.

If you have any queries please feel free to contact us on our E-mail infoijrcm@gmail.com.

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward an appropriate consideration.

With sincere regards

Thanking you profoundly

Academically yours

Sd/-

Co-ordinator

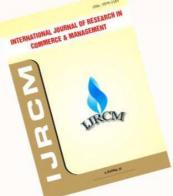
ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active cooperation of like-minded scholars, we shall be able to serve the society with our humble efforts.

Our Other Fournals







INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT & MANAGEMENT A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories