

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

I  
J  
R  
C  
M



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.A.

as well as in Open J-Gate, India [link of the same is duly available at Infibnet of University Grants Commission (U.G.C.)]

Registered & Listed at: Index Copernicus Publishers Panel, Poland & number of libraries all around the world.

Circulated all over the world & Google has verified that scholars of more than 1667 Cities in 145 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

[www.ijrcm.org.in](http://www.ijrcm.org.in)

## CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	<b>EXPERT EVIDENCE: RULE OF ADMISSIBILITY IN INDIA WITH SPECIAL REFERENCE TO BALLISTICS</b> <i>BHAGWAN R. GAWALI &amp; DR. DIPA DUBE</i>	1
2.	<b>USING ARTIFICIAL NEURAL NETWORKS TO EXAMINE SEMIOTIC THEORIES OF ACCOUNTING ACCRUALS IN TEHRAN STOCK EXCHANGE</b> <i>AFSANEH MIRZAEI, ALI REZA MEHRAZIN &amp; ABULGHASEM MASYHAABADI</i>	4
3.	<b>JOB SATISFACTION AMONG EMPLOYEES IN INDUSTRIES IN TAMIL NADU, INDIA</b> <i>DR. ANTHEA WASHINGTON</i>	11
4.	<b>THE ICT ENABLED BUSINESS TRANSFORMATION IN THE BANKING INDUSTRY OF SRI LANKA (A CROSS CASES ANALYSIS)</b> <i>POONGOTHAI SELVARAJAN</i>	17
5.	<b>THE NEED FOR ENERGY DEMAND SIDE MANAGEMENT IN COMMERCIAL AND RESIDENTIAL SECTORS IN NIGERIA</b> <i>AHMED ADAMU</i>	21
6.	<b>EMOTIONAL INTELLIGENCE, CUSTOMER ORIENTATION, ADAPTIVE SELLING AND MANIFEST INFLUENCE: A COMPLETE TOOL KIT IN MARKETING EXCHANGES FOR SALESPERSONS</b> <i>ARSLAN RAFI, ZEESHAN ASHRAF, DILJAN KHAN, YASIR SALEEM &amp; TAJAMAL ALI</i>	27
7.	<b>PARADIGMS OF MODERN DAY MARKETING - A LOOK AT CURRENT SCENARIO</b> <i>SUPREET AHLUWALIA &amp; VIVEK JOSHI</i>	33
8.	<b>MIS VS. DSS IN DECISION MAKING</b> <i>DR. K.V.S.N. JAWAHAR BABU &amp; B. MUNIRAJA SEKHAR</i>	39
9.	<b>PRE-PROCESSING AND ENHANCEMENT OF BRAIN MAGNETIC RESONANCE IMAGE (MRI)</b> <i>K.SELVANAYAKI &amp; DR. P. KALUGASALAM</i>	47
10.	<b>IMPACT OF SERVICE QUALITY DIMENSIONS ON CUSTOMER SATISFACTION OF SBI ATM</b> <i>NAMA MADHAVI &amp; DR. MAMILLA RAJASEKHAR</i>	55
11.	<b>DEVELOPMENT OF LOW COST SOUND LEVEL ANALYZER USING SCILAB FOR SIMPLE NOISE MEASUREMENT APPLICATIONS</b> <i>OJAS M. SUROO &amp; MAHESH N. JIVANI</i>	62
12.	<b>INFLUENCE OF DEMOGRAPHY ON STORE CHOICE ATTRIBUTES OF MADURAI SHOPPERS IN RETAIL OUTLETS</b> <i>DR. S. SAKTHIVEL RANI &amp; C.R.MATHURAVALLI</i>	67
13.	<b>TRADE FINANCE AND METHODS &amp; CHARACTERISTICS OF INTERNATIONAL PAYMENTS FOR INDIAN EXPORTERS</b> <i>RAJENDRA KUMAR JHA</i>	72
14.	<b>CUSTOMER SERVICE THROUGH THE BANKING OMBUDSMAN SCHEME - AN EVALUATION</b> <i>DR. SUJATHA SUSANNA KUMARI. D</i>	78
15.	<b>MEASURING THE FINANCIAL HEALTH OF SELECTED LARGE SCALE IRON AND STEEL COMPANIES IN INDIA USING Z-SCORE MODEL</b> <i>DR. P. THILAGAVATHI &amp; DR. V. RENUGADEVI</i>	82
16.	<b>DESIGN AND DEVELOPMENT OF 4-TIER ARCHITECTURE OF VIRTUAL NETWORK MODEL FOR FINANCIAL AND BANKING INSTITUTIONS</b> <i>SARANG JAVKHEDKAR</i>	87
17.	<b>IMPACT OF FACE BOOK ADVERTISEMENT AND AWARENESS LEVEL AMONG THE CLIENTS WITH SPECIAL REFERENCE TO ERODE CITY</b> <i>S.KOWSALYADEVI</i>	91
18.	<b>HUMAN RESOURCES IN SIX SIGMA - A SPECIAL LOOK</b> <i>DR. B.SUMATHISRI</i>	97
19.	<b>MOBILITY AND RETENTION OF FEMALE FACULTIES IN PRIVATE COLLEGE</b> <i>POOJA</i>	100
20.	<b>EFFECT OF WORKING CAPITAL MANAGEMENT ON PROFITABILITY OF PHARMACEUTICALS FIRMS IN INDIA</b> <i>NILESH M PATEL &amp; MITUL M. DELIYA</i>	107
21.	<b>AWARENESS OF TAX PLANNING - A STUDY WITH SPECIAL REFERENCE TO GOVERNMENT EMPLOYEES</b> <i>DR. K. UMA &amp; G. LINGAPERUMAL</i>	113
22.	<b>A STUDY ON ADOPTION OF INTERNET BANKING AMONG STUDENTS IN INDORE</b> <i>HARDEEP SINGH CHAWLA &amp; DR. MANMINDER SINGH SALUJA</i>	117
23.	<b>IMPACT OF MERGERS ON STOCK RETURNS: A STUDY WITH REFERENCE TO MERGERS IN INDIA</b> <i>KUSHALAPPA. S &amp; SHARMILA KUNDER</i>	124
24.	<b>SECURING E-COMMERCE WEBSITES THROUGH SSL/TLS</b> <i>PRADEEP KUMAR PANWAR</i>	130
25.	<b>EFFICIENT ARCHITECTURE FOR STREAMING OF VIDEO OVER THE INTERNET</b> <i>HEMANT RANA</i>	134
26.	<b>A STUDY ON INDIAN FOREIGN EXCHANGE MARKET EFFICIENCY – APPLICATION OF RANDOM WALK HYPOTHESIS</b> <i>ANSON K.J</i>	138
27.	<b>AN EMPIRICAL ANALYSIS OF FACTORS AND VARIABLES INFLUENCING INTERNET BANKING AMONG BANGALORE CUSTOMERS</b> <i>VIDYA CHANDRASEKAR</i>	143
28.	<b>EMPLOYEE ATTRITION IN SOFTWARE INDUSTRY</b> <i>I.NAGA SUMALATHA</i>	149
29.	<b>IMPORTANCE OF XBRL: AN OVERVIEW</b> <i>B.RAMESH</i>	154
30.	<b>AN ANALYSIS OF ANEKA (CLOUD COMPUTING TOOL)</b> <i>AANHA GOYAL &amp; ANSHIKA BANSAL</i>	159
	<b>REQUEST FOR FEEDBACK</b>	163

## 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

**DR. MOHITA**

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

## ADVISORS

**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. 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. MOHITA**

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

## EDITORIAL ADVISORY BOARD

**DR. RAJESH MODI**

Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia

**PROF. PARVEEN KUMAR**

Director, M.C.A., Meerut Institute of Engineering & Technology, Meerut, U. P.

**PROF. H. R. SHARMA**

Director, Chhatrapati Shivaji Institute of Technology, Durg, C.G.

**PROF. MANOHAR LAL**

Director & Chairman, School of Information & Computer Sciences, I.G.N.O.U., New Delhi

**PROF. ANIL K. SAINI**

Chairperson (CRC), Guru Gobind Singh I. P. University, Delhi

**PROF. R. K. CHOUDHARY**

Director, Asia Pacific Institute of Information Technology, Panipat

**DR. ASHWANI KUSH**

Head, Computer Science, University College, Kurukshetra University, Kurukshetra

**DR. BHARAT BHUSHAN**

Head, Department of Computer Science & Applications, Guru Nanak Khalsa College, Yamunanagar

**DR. VIJAYPAL SINGH DHAKA**

Dean (Academics), Rajasthan Institute of Engineering & Technology, Jaipur

**DR. SAMBHAVNA**

Faculty, I.I.T.M., Delhi

**DR. MOHINDER CHAND**

Associate Professor, Kurukshetra University, Kurukshetra

**DR. MOHENDER KUMAR GUPTA**

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

**DR. SAMBHAV GARG**

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

**DR. SHIVAKUMAR DEENE**

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

**DR. BHAVET**

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

***ASSOCIATE EDITORS***

**PROF. ABHAY BANSAL**

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

**PROF. NAWAB ALI KHAN**

Department of Commerce, Aligarh Muslim University, Aligarh, U.P.

**ASHISH CHOPRA**

Sr. Lecturer, Doon Valley Institute of Engineering & Technology, Karnal

***TECHNICAL ADVISORS***

**AMITA**

Faculty, Government M. S., Mohali

**DR. MOHITA**

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

**SURENDER KUMAR POONIA**

## 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: [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com).

## GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. **COVERING LETTER FOR SUBMISSION:**

DATED: \_\_\_\_\_

**THE EDITOR**  
IJRCM

**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 ' \_\_\_\_\_ ' for possible publication in your journals.

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.

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 **BRITISH ENGLISH** prepared on a standard A4 size **PORTRAIT SETTING PAPER**. 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****FINDINGS****RECOMMENDATIONS/SUGGESTIONS****CONCLUSIONS****SCOPE FOR FURTHER RESEARCH****ACKNOWLEDGMENTS****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.

**JOURNAL 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>

**EXPERT EVIDENCE: RULE OF ADMISSIBILITY IN INDIA WITH SPECIAL REFERENCE TO BALLISTICS**

**BHAGWAN R. GAWALI**  
**RESEARCH SCHOLAR**  
**RAJIV GANDHI SCHOOL OF IP LAW**  
**INDIAN INSTITUTE OF TECHNOLOGY**  
**KHARAGPUR**

**DR. DIPA DUBE**  
**ASST. PROFESSOR**  
**RAJIV GANDHI SCHOOL OF IP LAW**  
**INDIAN INSTITUTE OF TECHNOLOGY**  
**KHARAGPUR**

**ABSTRACT**

*The law of evidence is the edifice on which the system of dispensation of justice rests. In fact, the purpose and object of evidence is to guide the Courts to come to a conclusion regarding a case at hand. But, in certain cases, where the questions involved are beyond the range of common experience and knowledge, evidence in form of facts pose problems as the Court may not have sufficient competence to arrive at a conclusion based on those facts. Thus, the need arises for experts who have the required ability and knowledge to tender evidences. Section 45 of the Indian Evidence Act, 1872 deals with expert evidence. It allows an expert to tender evidence on a particular fact in question and to show to the court that his findings are unbiased and scientific. In contemporary times, the reliance on expert evidence has been overwhelming, especially in the area of ballistics. The present article tries to critically analyze the rules of admissibility with regard to expert evidence, in general and ballistics evidence, in particular.*

**KEYWORDS**

Ballistics, Expert, Evidence, Admissibility, Evidence, Opinion.

**INTRODUCTION**

The law of evidence is the edifice on which the entire system of dispensation of justice is based. In fact, the purpose and object of evidence is to guide the Courts to come to a conclusion regarding a case at hand. But, in certain cases, where the questions involved are beyond the range of common experience and knowledge, evidence in form of facts pose problems as the Court may not have sufficient competence to arrive at a conclusion based on those facts. Thus, the need arises for experts who have the required ability and knowledge, through experience and education, to tender evidences on facts. Expert Evidence is the desideratum of the present century where complex and intricate issues involving scientific knowledge and technological skills are slowly being enmeshed in legal domain. But how far that scientific testimony can make way in the traditional adjudication mechanism is a big question and the present article examines the extent and scope of admissibility of expert evidence and its appreciation by courts, especially in the area of Ballistics.

**EXPERT-WHO IS**

Section 45 of the Indian Evidence Act, 1872 deals with expert evidence and allows the production of an expert to aid the judge to form an opinion on points of foreign law or science or art or as to identity of handwriting.<sup>1</sup>

An expert is a person who has devoted time and study to a special branch of learning, and thus, is especially skilled on those points on which he is asked to state his opinion. Under Section 45 of the Indian Evidence Act, 1872 expert means one who is a "specially skilled person". Such persons may also be considered as experts who practice a business/profession, which requires them to possess certain knowledge of the matter in hand.

There are no tests as such laid down by law to determine how much experience or qualification a person must possess to be taken as an expert. A combination of elements may be considered for accepting a witness as an expert, like:

1. Expertise, including academic achievements, professional training, experience in the trade, means at the command and the application of those means for coming to a conclusion.
2. Clarity, include avoidance of jargons, use of simple language, evidence supported by photographs, charts, sketches etc. so as to make his opinion appreciated by layman.
3. Relevancy does not include mere presumption of facts, but drawing of conclusions either from his own experience or from published works of accredited authors.

**EXPERT EVIDENCE: ADMISSIBILITY AND APPRECIATION**

Expert evidence is an "opinion" evidence" and as a general rule, the opinion of a witness on a question of fact or of law is irrelevant.<sup>2</sup> A witness may testify only to facts, not to their effect or result, or to his conclusions based on those facts and he can give as evidence only of facts, which he has directly perceived through his senses.<sup>3</sup> It is the function of the judge to form his own opinion on the facts stated.<sup>4</sup> The opinion of witnesses possessing peculiar skills (as of experts) is an exception to this rule.<sup>5</sup> It is important to note here that the opinion of an expert is not accepted just because he says so. He has to satisfy the court about his expertise on the particular fact in question<sup>6</sup> and further, has to show to the court that his findings are unbiased and scientific. The duty of the expert witness is to furnish the judge with necessary scientific criteria for testing the accuracy of the conclusions so as to enable the judge-to form his "independent" judgment by application of these criteria.<sup>7</sup>

The report of an expert is not admissible unless he has been examined as a witness and the party affected by it has had the opportunity of cross-examining him. Further, a finding by an expert, not supported by reasons, has to be rejected.<sup>8</sup> Thus, the admissibility of an expert's evidence is subject to certain checks, which are in furtherance of the basic ideas of justice. It is argued that after all an expert is a human being and it must be borne in mind that an expert witness, however impartial he may wish to be, is likely to be unconsciously prejudiced in favour of the side which calls him. The mere fact of opposition on the part of the other side is apt to create a spirit of partisanship and rivalry, so that an expert witness is unconsciously impelled to support the view taken by his own side. Besides, it must be remembered that an expert is often called by one side simply because it has been ascertained that he holds the views favourable to its interest.<sup>9</sup> This is one reason why at times in certain cases two experts reach a different conclusion on the basis of the same material.<sup>10</sup>

Some scholars are antagonistic to the very concept of expert evidence and opine that "perhaps the testimony which least deserves the credit is that of skilled witness. These witnesses are usually required to speak, not to facts but to opinions: and when this is the case, it is often quite surprising to see with that facility, and to what an extent, their views can be made to correspond with the wishes of the interests of the parties who call them."<sup>11</sup>

The response to this view can be that the general motto for expert witnesses, viz. "An expert witness is there neither for the prosecution nor for the defense, but is there to assist the Court" should be sacredly espoused by the experts and an approach of caution should be taken up by the Court. This basically means that the rule that "it is unsafe to base a conviction solely on the expert opinion without substantial corroboration" should be applied in all cases<sup>12</sup> where an expert witness is giving evidence. Further, the testimony of an expert is to be received with great care and caution.<sup>13</sup> It has also been held by the Courts that the "expert evidence is a weak type of evidence that needs independent and reliable corroboration".<sup>14</sup> Although there is no clear bar to base a conviction solely on expert evidence,<sup>15</sup> it is advisable, in the opinion of the authors, not to base conviction solely on the opinion evidence of an expert, "especially if the evidence so adduced is not supported by logical and scientific reasons."<sup>16</sup>

One of the rules of caution that all courts follow as regards expert opinion is that they should never surrender their free will or independence or judgment to an expert. In all cases in which expert evidence is adduced before it, the Court must after giving it such weight as it deserves and the court thinks fit, make up its own mind upon the issue in respect of which the expert testimony has been given.<sup>17</sup>

### FORENSIC BALLISTICS: MEANING AND SCOPE

The word "Ballistics" is etymologically derived from the Latin word 'ballista' and refers to a body in motion. Ballistics is that part of forensic science which deals with the study of motion of projectiles. Projectile is known as a body projected by force mostly from firearms, especially through air. The science of projectile thus involves the study of firearms.<sup>18</sup> Forensic ballistics is the study of firearms, ammunition and explosives with a view to reconstruct the crime scene accurately. It has now become an integral part of the crime investigation as the reconstruction can lead to many evidences which can be used in a given case with major effects. The general fact of ballistics is that no missiles discharged from the same or different firearms bear the same trace marks.<sup>19</sup> Thus, for example, each rifled firearm leaves its own striations (a sort of tell-tale finger-print) in terms of barrel and firing pin markings on the fired bullet and cartridge case respectively. This makes it possible to trace a bullet or cartridge to the particular weapon, which is in question. If an evidence bullet has the same class characteristics and matching individual characteristics to test bullets fired from a 'suspect firearm', the firearm examiner can conclude that the bullet was fired from the suspect firearm.<sup>20</sup> A successful demonstration of these facts by the use of comparison microscope along with photomicrography can be the most valuable and foolproof evidence.

Ballistic experts work closely with the police investigating officers, members of the legal profession and judiciary before whom they eventually appear as independent expert witnesses.<sup>21</sup> They, play an important 'complementary' role in ensuring justice in the modern society.<sup>22</sup> With the assistance and expertise of ballistics, it is now possible not only to tally the cartridge fired with the firearm used, but a number of other important factors also, though with varying degrees of probability. Among these factors are the range of fire, the approximate time when the firearm was discharged<sup>23</sup> and other questions of similar nature. A ballistics expert with the help of a chemical analyst can discover several facts in relation to the part played by the particular firearm in the commission of the offence, the nature of ammunition used, etc. The services of a ballistics expert is therefore necessary and valuable in cases where firearms are recovered either at the scene of the crime or from the accused.<sup>24</sup>

Sometimes firearms are left on the scene of an event. The place where the firearm is found is carefully surveyed to find foot-footwear prints, transport tracks, etc. Handprints may be detected too, specifically on the trigger guard, slide casing and other parts. In visually inspecting a firearm, all its structural features, damage and contamination is described in the report. The type, model, caliber, number and trademarks are established by the ballistics expert. The condition of the bore walls is also checked to detect the presence or absence of powder gas odour, which is very important for establishing when the shot was fired. Then, the flight detection of the projectile is determined by inspecting all the objects in the line of fire, especially all the dents and damages in walls, ceilings and floor. When inspecting the bullet, the ballistic expert establishes its form design, size, colour, number of traces left by the bore lands. When inspecting pellets, their number, form, maximal and minimal dimensions are also established by the ballistics expert. All of these are some of the procedures followed by the ballistics expert to help in reconstructing the offence committed with fire. In addition to the above investigations and methods, the ballistic expert also has to decide some other questions, namely; a) whether a given object is a firearm-this question could arise in examining a homemade weapon manufactured in simplified form to copy a known model. The question is resolved by studying the mechanism and the individual parts of that device to see whether it can actually ignite gunpowder, eject a projectile and develop striking power b) Whether a shot can be fired from a given type of weapon- this question is important in establishing its possible use as an instrument of crime c) Whether the weapon was the one used in the commission of the crime.

In the light of the above discussion, a ballistic expert has two basic functions: -<sup>25</sup>

1. The scientific function — collecting, testing and evaluating evidence and thereby forming an opinion as to that evidence.
2. The forensic function — communicating that opinion to the Court so as to help it reach a logical conclusion.

### BALLISTIC EXPERT'S EVIDENCE: ADMISSIBILITY AND APPRECIATION

In India, in the case of *State (through Central Bureau of Investigation New Delhi) v. S. J. Choudhary*,<sup>26</sup> the Supreme Court has held that the expression "science or art" in Section 45 of the Evidence Act 1872 is of wide import. Each of the words 'science' and 'art' has to be construed widely to include within its ambit the opinion of an expert in each branch of these subjects: the meaning of the word 'science' as understood ordinarily with reference to its dictionary meaning must be attributed to the word. Therefore, the present section 45 of the Indian Evidence Act, 1872 can be better worded by amendment to clearly imply the above observations. It would be of further help if the words "or of science or art" in section 45 of the Indian Evidence Act, 1872 are substituted by the words "or of science, art, skill or trade or others of the like kind."<sup>27</sup>

Thus, by the above given understanding of Section 45 of the Indian Evidence Act, 1872 the word 'science' is not just confined to physical sciences, but any matter for the purpose of forming an opinion which requires some special skill, special training or special study is regarded as science. Thus, it can be easily concluded that in criminal cases where firearms are alleged to have been used, the Court is fully justified in 'admitting' the opinion of the ballistic experts as they are persons specially trained in this field of science. This is made clear by the Supreme Court of India in the case *Sukhwant Singh v. State of Punjab*,<sup>28</sup> where it was held that 'the failure to produce the expert evidence before the trial Court affects the credit-worthiness of the prosecution case to a great extent.'<sup>29</sup> It was also held that the cases in which the examination of a ballistic expert is essential will 'depend on the circumstances of each case'. The most common circumstance where the conditions are apt for the evidence of a ballistic expert is in a case 'where death is due to injuries or wounds caused by lethal weapons. It has been considered to be the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the weapon with which and in the manner in which they are alleged to have been caused.'<sup>30</sup> This understanding of the courts today is the result of a very appropriate judgment by the Supreme Court in the case of *Jaidev and Hari Singh v. State of Punjab*,<sup>31</sup> where the case of *Mohinder Singh v. State*,<sup>32</sup> was quoted by the learned counsel for the appellants to say that the Court was of the opinion that where a firearm is used in the perpetration of a crime, the prosecution 'must' bring expert evidence to connect the injuries with the weapon and its alleged manner of use. The facts of Jaidev's case were that the appellants had surrendered a revolver and the prosecution was contending that the injuries were caused by a rifle, which had not been recovered. This made the Court to give a reasonable remark that it may be a case that the appellants may have deliberately surrendered the revolver to introduce complications in the case. Thus, there was no purpose for which the prosecution could be expected to examine an expert in ballistics. Thus, Mohinder Singh case was held not applicable in the case at hand. In *Ghurey Lal v. State of U.P.*,<sup>33</sup> where question arose with regard to the complicity of the accused in the murder of the deceased, the Supreme Court relied on the Ballistics report to hold that the two shots allegedly fired causing the death of one and injuries to another were not from a single firearm, as alleged by the prosecution. The Court opined, "the medical evidence coupled with the Ballistic Expert report revealed the existence of two fires from two weapons and as such was inconsistent with the prosecution story.... The Ballistic Expert is a disinterested, independent witness who has technical knowledge and experience. It follows that the trial judge was fully justified in placing reliance on his report." The apex court accordingly acquitted the accused.<sup>34</sup> In *Mahesh Chand v. U.T. Chandigarh*,<sup>35</sup> where a country made pistol alongwith three live cartridges and an empty cartridge were recovered from the accused and a bullet was recovered from the body of the victim and on examination, the Ballistic expert opined that 'they could not have been fired through any other fire-arm because every fire arm has its own individual characteristic marks.', the Supreme Court proceeded to hold that the case against the accused is proved beyond reasonable doubt.

It is important to note that ballistic experts' opinion has been consistently regarded as significant. In the case of *Ajay Singh v. State of Bihar*<sup>36</sup>, the pistol used in the perpetration of the crime was never sent to the ballistic expert for examination. This was seen as a lacuna on the part of the prosecution but the case did not go in favour of the appellant as there were witnesses who testified to the satisfaction of the Court that accused had done that act of crime.<sup>37</sup> "It cannot be laid down as a general proposition that in every case where a firearm is allegedly used by an accused person, the prosecution must lead the evidence of a Ballistic Expert to prove the charge, irrespective of the quality of the direct evidence available on record. It needs little emphasis that where direct evidence is of such an unimpeachable character, and the nature of injuries, disclosed by post-mortem notes is consistent with the direct evidence, the examination of Ballistic Expert may not be regarded as essential. However, where direct evidence is not available or that there is some doubt as to whether the injuries could or could not have been caused by a particular weapon, examination of an expert would be desirable to cure an apparent inconsistency or for the purpose of corroboration of oral evidence."<sup>38</sup> In *Charan Singh v. State of Punjab*,<sup>39</sup> the medical and ballistic expert opinion was conflicting about the range of fire. The court, after appreciating the evidence before it, was satisfied with the scientific conclusions of the ballistic expert. This was one of the landmark cases in India where the ballistic expert's opinion prevailed over that of the medical expert.<sup>40</sup> Furthermore, in the case of *Kalua v. State of Uttar Pradesh*<sup>41</sup>, the court being satisfied with the evidence of Ballistic Expert held that the conclusion of Ballistic expert is sufficient to prove the guilt of the accused.

## CONCLUSION

In the contemporary social context, the role and significance of ballistics can be overwhelming in administration of criminal justice. While on the one hand, the sophistication and complexities of modern weapons and arms and ammunition call for expert knowledge and skills in deciphering the nature, category and manner of use in specific cases, on the other, the effective interpretations of culpability and criminal liability require the blending of such knowledge in legal paradigm. In fact, the latter is important for bringing the guilty to the gallows and the innocent to freedom. However, what is important is the proper recognition and acceptance of expert evidence as a significant tool in the administration of justice. The old adage of "Witnesses are the eyes and ears of the Court," may sound good and in fact may be true to an extent; but in the present era of organized crimes, trans-boundary criminal activities and terrorism, reliance on testimonies of ordinary witnesses may be grossly insufficient and inadequate to excavate the extent and depth of illegalities involved. It may be possible only by means of distinct and specific knowledge of intricate aspects which only an expert may be qualified and experienced to testify. Thus, increased reliance on expert evidence and improved recognition of its value and credibility may help in efficient and effective dispensation of justice in future.

## REFERENCES

1. Section 45 reads as: "When the Court has to form an opinion upon a point of foreign law, or of science, or art or as to identity of handwriting or finger impression, the opinions upon that point of persons specially skilled in such foreign law, science or art or in questions as to identity of handwriting or finger impressions are relevant facts. Such persons are called experts."
2. *Khushboo Enterprises v. Forest Range Officer*, AIR 1994 SC 120.
3. *Babuli v. State*, 1974 Cri LJ 510.
4. M.C. Sarkar, SC Sarkar and PC Sarkar, *Sarkar's Law of Evidence* (Wadhwa and Company Law Publishers: Nagpur, 1999) 863
5. Field, *Commentary on Law of Evidence* (Revised by Gopal S. Chaturvedi, Delhi Law House, 2001) p.2428.
6. *State v. Madhukar*, 1967 Cri LJ 167.
7. *State of Himachal Pradesh v. Jai Lal*, AIR 1999 SC 3318.
8. *Haji Mohammed Ekramul Haq v. State of West Bengal*, AIR 1959 SC 488.
9. *Hari Singh v. Lachmi Devi*, AIR 1921 Lah.126.
10. *Suresh Kumar v. Mewaram*, AIR 1991 P&H 254.
11. Ejaz, Ahmed, *Crimes-Expert Evidence (Medical and Non-medical)* (Vinod Publications: Delhi, 1993) 32.
12. This basically means that the credit of an expert can be impeached like that of any other witness under Sections 146, 153 and 155 of the Indian Evidence Act, 1872.
13. *Magan Bihari Lal v. State of Punjab*, 1977 Cri LJ 711.
14. *S. Gopal Reddy v. State of Andhra Pradesh*, 1996 Cri LJ 3237.
15. *Murailal v. State of MP*, AIR 1980 SC 531.
16. *ibid.*
17. *State of UP v. Krishna Gopal*, 1989 Cri LJ 288.
18. Rashika Gupta, *Ballistics: the probative value of evidence*, 1992 Cri LJ 121.
19. MC Sarkar, SC Sarkar and PC Sarkar, *Sarkar's Law of Evidence* (Wadhwa and Company Law Publishers: Nagpur, 1999) 877.
20. *Param Jeet Singh*, *Growing role of experts testimony in the Administration of justice*, 1990 Cri LJ 109.
21. *ibid.*
22. *ibid.*
23. It is possible to form a rough estimate of the time of fire from gunpowder residue, carbon monoxide remains, mercury deposition etc. But it is difficult to fix the correct time. See, B.R.Sharma, *Forensic Science in Criminal Investigation and Trials* (Universal Law Pub., 4<sup>th</sup> Edn, 2005) p. 469.
24. *Arava Nagreddi v. State*, (1968) 12 MJHR (Cr).
25. Richard, *Saferstein, Forensic science Handbook* (Prentice Hall Regents: New Jersey, 1982) p.5.
26. 1996 Cri LJ 1713.
27. *Supra* n.4, p 868.
28. 1996 Cri LJ 1713.
29. *State of Madhya Pradesh v. Surpa*, AIR 2001 SC 2408
30. *Gurcharan Singh v. State of Punjab*, AIR 1963 SC 340.
31. 1963 Cri LJ 495.
32. AIR 1953 SC 415.
33. MANU/SC/3223/2008
34. See, *Puran Singh v. State of Uttaranchal*, 2008 CriLJ 1058; *Budh Singh v. State of M.P.*, 2007(8)SCALE 252; *Suresh Chandra v. State of Uttar Pradesh* AIR 2005 SC 3120; *Ramakant Rai v. Madan Rai and Ors.*, AIR 2004 SC 77.
35. AIR 1995 SC 1951
36. AIR 2000 SC 3538.
37. *Vineet Kumar Chauhan v. State of U.P.*, AIR 2008 SC 780
38. *Gurcharan Singh v. State of Punjab*, MANU/SC/0136/1962.
39. 1974 Cri LJ 1253.
40. *Kartar Singh v. State of Punjab*, AIR 1977 SC 349; *Kartik Harijan v. State of Orissa*, 1995 Cri LJ 2019; *Raza Pasha v. State of Madhya Pradesh*, AIR 1983 SC 575.
41. AIR 1958 SC 180

## **REQUEST FOR FEEDBACK**

**Dear Readers**

At the very outset, International Journal of Research in Computer Application 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 [infoijrcm@gmail.com](mailto: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](mailto: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 co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

### *Our Other Journals*

