

### 3.4.1 The institution ensures implementation of its stated Code of Ethics for research

- Copy of the syllabus of the research methodology course work to indicate if research ethics is included.
- Details of ethics for research document.
- Research advisory committee document.
- Guidelines to use Plagiarism check software, Bills of purchase of licensed plagiarism check software in the name of the HEI, and usage data.
- Sample copies of Plagiarism report.

# PhD Programme - 2018



## Course Work Syllabus

### School of Mechanical Engineering



## KLE Technological University

(Established under Karnataka Act No.22, 2013)

Vidyanagar, Hubballi- 580 031, Karnataka State- India

<b>FORM</b> <b>ISO 9001: 2008 – KLE Tech</b> <b>School of Mechanical Engineering</b>	<b>Document #:</b> <b>FMCD2009</b>	<b>Rev: 1.0</b>
<b>Curriculum Content- Course-wise</b>		<b>Page 2 of 4</b>
		<b>Year: 2018</b>

<b>Program: Ph.D</b>		
<b>Course Title: Research Methodology</b>		<b>Course Code: 17ECRR901</b>
<b>L-T-P-SS: 4-0-0</b>	<b>Credits: 4</b>	<b>ESA : 100</b>
<b>Teaching Hours: 50</b>	<b>Examination duration: 3Hrs</b>	
<b>Unit-I</b>		
<b>Chapter No. 1 RESEARCH – A way of Thinking</b> Research: an integral part of your practice, Research: a way to gather evidence for your practice, Applications of research, Research: what does it mean? The research process: characteristics and requirements, Types of research, Paradigms of research <b>Chapter No. 2 The research process: a quick glance</b> The research process: a quick glance, The research process: an eight-step model, Phase I: deciding what to research, Step I: formulating a research problem, Phase II: planning a research study, Step II: conceptualizing a research design, Step III: constructing an instrument for data collection, Step IV: selecting a sample, Step V: writing a research proposal, Phase III: conducting a research study, Step VI: collecting data, Step VII: processing and displaying data, Step VIII: writing a research report		
<b>Unit –II</b>		
<b>STEP I FORMULATING A RESEARCH PROBLEM</b> <b>Chapter No.3 Reviewing the literature,</b> The place of the literature review in research, How to review the literature, Writing about the literature reviewed, <b>Chapter No. 4 Formulating a research problem</b> The research problem, The importance of formulating a research problem. Sources of research problems. Considerations in selecting a research problem. Steps in formulating a research problem. The formulation of research objectives. The study population. Establishing operational definitions. Formulating a research problem in qualitative research. <b>Chapter No. 5 Identifying variables</b> What is a variable, The difference between a concept and a variable, Converting concepts into variables, Types of variable, Types of measurement scale <b>Chapter No. 6 Constructing Hypotheses</b> The definition of a hypothesis, The functions of a hypothesis, The testing of a hypothesis, The characteristics of a hypothesis, Types of hypothesis, Errors in testing a hypothesis, Hypotheses in qualitative research		
<b>Unit-III</b>		
<b>STEP II CONCEPTUALISING A RESEARCH DESIGN</b> <b>Chapter No. 7 The research design</b> What is a research design?, The functions of a research design, The theory of causality and the research design. <b>Chapter No.8 Selecting a study design</b> Differences between quantitative and qualitative study designs, Study designs in quantitative research, Other designs commonly used in quantitative research, Study designs in qualitative research, Other commonly used philosophy-guided designs		
<b>Unit-IV</b>		
<b>STEP III CONSTRUCTING AN INSTRUMENT FOR DATA COLLECTION</b> <b>Chapter No. 9 Selecting a method of data collection</b>		

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Differences in the methods of data collection in quantitative and qualitative research, Major approaches to information gathering, Collecting data using primary sources, Methods of data collection in qualitative research, Collecting data using secondary sources

**Chapter No. 10 Collecting data using attitudinal scales**

Measurement of attitudes in quantitative and qualitative research, Attitudinal scales in quantitative research, Functions of attitudinal scales, Difficulties in developing an attitudinal scale, Types of attitudinal scale, Attitudinal scales and measurement scales, Attitudes and qualitative research

**Chapter No. 11 Establishing the validity and reliability of a research instrument**

The concept of validity, Types of validity in quantitative research, The concept of reliability, Factors affecting the reliability of a research instrument, Methods of determining the reliability of an instrument in quantitative research, Validity and reliability in qualitative research

**Unit-V**

**STEP IV SELECTING A SAMPLE**

**Chapter No. 12 Selecting a sample**

The differences between sampling in quantitative and qualitative research, Sampling in quantitative research, Sampling in qualitative research

**STEP V WRITING A RESEARCH PROPOSAL**

**Chapter No. 13 How to write a research proposal**

The research proposal in quantitative and qualitative research, Contents of a research proposal, Work schedule

**Unit-VI**

**STEP VI COLLECTING DATA**

**Chapter No. 14 Considering ethical issues in data collection**

Ethics: the concept, Stakeholders in research, Ethical issues to consider concerning research participants, Ethical issues to consider relating to the researcher, Ethical issues regarding the sponsoring organisation

**STEP VII PROCESSING AND DISPLAYING DATA**

**Chapter No. 15 Processing data:** Part one: Data processing in quantitative studies, Part two: Data processing in qualitative studies, The role of statistics in research

**Chapter No. 16 Displaying data:** Methods of communicating and displaying analysed data- Text, Tables, Graphs

**Unit-VII**

**STEP VIII WRITING A RESEARCH REPORT**

**Chapter No. 17 Writing a research report**

Writing a research report, Developing an outline, Writing about a variable, Referencing, Writing a bibliography

**Chapter No. 18 Research methodology and practice evaluation**

What is evaluation?, Why evaluation?, Intervention–development–evaluation process, Perspectives in the classification of evaluation studies, Types of evaluation from a focus perspective, Types of evaluation from a philosophical perspective, Undertaking an evaluation: the process, Involving stakeholders in evaluation, Ethics in evaluation

**Text Book:**

1. Ranjit Kumar, "Research Methodology – A step by step guide for Beginners", Pearson Edition, Singapore.
2. Kothari C. R. "Research Methodology – Methods & Techniques", Wishwa Prakashan, A Division of New Age International Pvt. Ltd..



	<b>FORM</b> ISO 9001: 2008 – KLE Tech School of Mechanical Engineering	Document #: FMCD2009	Rev: 1.0
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**Institutional Ethics Committee for Human Research (IEC)**

Sl. No.	Name	Role	Address
1	Dr. Uma Mudenagudi	Chairman	Dean (R&D) KLE Technological University Hubballi-580031 Email ID: <a href="mailto:dean_rd@kletech.ac.in">dean_rd@kletech.ac.in</a> Mobile:9343392667
2	Dr.Sanjay Kotabagi	Member	Dean- Student Welfare Professor-School of Mechanical Engineering Dean- Student Affairs, HoD-Humanities & Social Sciences, KLE Technological University, Hubballi: 580 031 Email ID: <a href="mailto:dean_sw@kletech.ac.in">dean_sw@kletech.ac.in</a> Mobile: 9448564580
3	Prof. S R Mahadeva Prasanna	Member	Dean (Faculty Welfare) Dean (Research & Development), IIT Dharwad. Email ID: <a href="mailto:prasanna@iitdh.ac.in">prasanna@iitdh.ac.in</a> Mobile: 91-836-2212-840
4	Smt. Otilie Kamal Anban Kumar	Member	eklakshay, C Lite Building, KLE Tech University, Vidyanagar, Hubballi, Karnataka 5800031 Email : <a href="mailto:ottiliekamal@gmail.com">ottiliekamal@gmail.com</a> Mobile: 984-570-1164
5	Smt. Malavika Kadakol	Member	CEO, Rapid India , Dharwad Email: <a href="mailto:malvika.kadakol@rapidnd.org">malvika.kadakol@rapidnd.org</a> Mobile: 9980607901
6	Adv. Sujata Laxmeshwar	Member	IP Legal Counsel, Intellectual Property Facilitation Centre (IPFC) KLE Technological University, Hubballi-580031 Email ID: <a href="mailto:ipfclegal@kletech.ac.in">ipfclegal@kletech.ac.in</a> Mobile: 93433924667
7	Dr.A.H.M.Viswanathaswamy	Member	Professor, KLE College of Pharmacy Vidyanagar, Hubballi - 580 031 Karnataka, India Cell : +91-9448667355 E-mail : <a href="mailto:vmhiremath2004@gmail.com">vmhiremath2004@gmail.com</a>
8	Dr.Basavaraj S. Hungund	Secretary	Professor and Head Department of Biotechnology KLE Technological University Hubballi-580031.India. Mobile:91-9449169349 Email ID: <a href="mailto:bshungund@kletech.ac.in">bshungund@kletech.ac.in</a>

  
Dean (R&D)

  
Registrar

**REGISTRAR**  
KLE Technological University  
HUBBALLI-580 031



**KLE** Technological  
University  
Creating Value  
Leveraging Knowledge

Ethics Review Committee

Guidelines

**KLE Technological University, Hubballi**

**2015**

(Established under Karnataka Act No.22, 2013)



**KLE** Technological  
University  
Creating Value  
Leveraging Knowledge



## 1. Introduction

The motto of the KLE Technological University is 'Creating Value and Leveraging Knowledge'. The mission of the University is to embrace the ethics of discovery, to inspire and encourage research by acquiring, investigating and developing knowledge for the good of society, and to ensure that all research is carried out in accordance with ethical principles.

The paramount principle governing all the research activities at KLE Tech involving human participants, personal data and human tissue is to respect the participant's dignity, rights, safety and well-being.

## 2. Participant's rights

Participants have a right, as a principle of research ethics, to:

- a) be fully informed about how and why their data will be collected and used as part of a research project, and by whom;
- b) consent to participate, withdraw from, or refuse to take part in research projects;
- c) maintain confidentiality (personal information or identifiable data should not be disclosed without participants' consent);
- d) ensure security of their data (data and samples collected should be kept secure and anonymised wherever appropriate);
- e) guarantee safety (participants should not be exposed to unnecessary or disproportionate levels of risk), and;
- f) request for erasure of their data if and when it is no longer required for research purposes.

## 3. Researchers' obligations

Researchers have an obligation to ensure that their research is conducted with:

- honesty;
- integrity;
- minimal possible risk to participants and to themselves; and
- respect for other people, their values and their cultures.

Guidance on the interpretation and application of these principles is detailed in this Policy document. The principles and requirements outlined in this Policy reflect the principles of research ethics but do not displace a researcher's obligation to comply with any relevant legal and regulatory requirements and their responsible management. Ethical research is therefore a matter of being risk aware, not risk averse. This policy specifies an ethics review procedure that is evolved to academic departments.

## 4. INTRODUCING RESEARCH ETHICS

The University's definition of research is as stated in the KLE Research Policy Document of KLE Technological University 2015. This applies to all research undertaken by, or on behalf of, the University, across all academic disciplines of KLE Tech.





The University's Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue, applies only to research involving human participants, personal data and human tissue.

## **5. RESEARCH ETHICS AT KLE Tech**

The University's Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue recognises that the responsibility for maintaining ethical conduct lies, in the first instance, with researchers themselves. If researchers do not take responsibility for the ethical conduct of their own research, defensible research ethics will be an unrealisable goal. To this end, responsibility for operating the University's Ethics Review Procedure, informed by the Policy, is devolved to academic departments and funding units.

This means that the formal ethical review of research proposals involving human participants, personal data or human tissue is carried out within the broad parameters provided by this Policy and the Research Ethics Approval Procedure.

The University Research Ethics Committee (UREC) is responsible to the University's Academic Council for: Reviewing the Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue every 3 years and reporting its findings to the University's Academic Council;

- Offering guidance within the University on the interpretation of the Policy;
- Resolving disputed or uncertain ethics approval decisions;
- Auditing and accrediting the ethics review arrangements in place on at least a 3 yearly basis, and monitoring the ethics review arrangements.
- In the event of concerns arising about whether a research proposal or ongoing research activity complies with the Policy, suspending the approval process, or the research activity in question, pending further investigation;
- Actively promoting awareness and knowledge of the Policy, and research ethics more generally, within the University via training events and other activities;
- Keeping abreast of externally-driven developments, policies and regulations concerning research ethics, and ensuring that the University meets all necessary requirements;
- Providing advice on any ethical matters relating to research that are referred to it from within the University.

## **6. SCOPE AND APPLICABILITY OF THE RESEARCH ETHICS POLICY**

- The University's Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue applies to:
- All faculty and students who conduct, or contribute to, research activities involving human participants, personal data or human tissue, whether these take place within or outside University premises and facilities, or are part of a work placement undertaken in fulfilment of a University degree award; and



- all individuals who, although they are not members of the University, conduct, or contribute to, research activities involving human participants, personal data or human tissue that take place within University premises and facilities.

## 7. RESEARCH ETHICS APPROVAL PROCEDURE

The University's approach to research ethics requires that all research involving human participants, personal data, or human tissue should be reviewed, and research ethics approval obtained, before data gathering commences.

## 8. COMPOSITION : Institutional Ethics Committee for Human Research (IEC)

Sl. No.	Name	Role	Address
1	Dr. Uma Mudenagudi	Chairman	Dean (R&D), KLE Technological University, Hubballi-580031 Email ID: <a href="mailto:dean_rd@kletech.ac.in">dean_rd@kletech.ac.in</a> Mobile:9343392667
2	Dr. Sanjaya Kotabagi	Member	Dean- Student Welfare Professor-School of Mechanical Engineering Dean- Student Affairs, HoD-Humanities & Social Sciences, KLE Technological University, Hubballi: 580 031 Email ID: <a href="mailto:dean_sw@kletech.ac.in">dean_sw@kletech.ac.in</a> Mobile: 9448564580
3	Prof. S R Mahadeva Prasanna	Member	Dean (Faculty Welfare) Dean (Research & Development), IIT Dharwad Email ID: <a href="mailto:prasanna@iitdh.ac.in">prasanna@iitdh.ac.in</a> Mobile: 91-836-2212-840
4	Smt. Otilie Kamal Anban Kumar	Member	eklakshay, C Lite Building, KLE Tech University, Vidyanagar, Hubballi. Karnataka 5800031 Email : <a href="mailto:ottiliekamal@gmail.com">ottiliekamal@gmail.com</a> Mobile: 984-570-1164
5	Smt. Malavika Kadakol	Member	CEO, Rapid India , Dharwad Email: <a href="mailto:malvika.kadakol@rapidnd.org">malvika.kadakol@rapidnd.org</a> Mobile: 9980607901





Sl. No.	Name	Role	Address
6	Adv. Sujata Laxmeshwar	Member	IP Legal Counsel, Intellectual Property Facilitation Centre (IPFC) KLE Technological University, Hubballi-580031 Email ID: <a href="mailto:ipfclegal@kletech.ac.in">ipfclegal@kletech.ac.in</a> Mobile: 93433924667
7	Dr.A.H.M.Viswanathaswamy	Member	Professor, KLE College of Pharmacy Vidyanagar, Hubballi - 580 031 Karnataka, India Cell : +91-9448667355 E-mail : <a href="mailto:vmhiremath2004@gmail.com">vmhiremath2004@gmail.com</a>
8	Dr. Basavaraj S. Hungund	Secretary	Professor, Department of Biotechnology KLE Technological University Hubballi-580031.India. Mobile:91-9449169349 Email ID: <a href="mailto:bshungund@kletech.ac.in">bshungund@kletech.ac.in</a>

The members are supposed to attend meetings arranged at the University for reviewing the research proposals in light of ethical concerns by invitation against receipt of an application from the candidate for approval. It is the responsibility of the candidate as well as supervisor/s to make sure that such ethical approval has been obtained prior to any data collection/analysis taking place. Applications for ethical approval should be submitted to the ethical committee with necessary documents. Approval from REC is required for the following cases:

**Sources of Data** All research that involves collecting new data from human participants and/or using pre-existing personal data. It covers all forms of collection process, e.g. experimental procedures/retreatment/intervention, focus group, telephone/internet survey, observation, personal interviews, or self-administered questionnaire, etc. It also includes physical settings, particularly in architectural research, whose anonymity needs to be safeguarded.

**Usage of pre-existing data** refers to retrieving readily available personal data from existing documents/records for secondary analysis, irrespective of whether or not the data are publicly available, whether or not the data originally collected are intentionally for research purpose, and whether the personal data from existing documents/records will be extracted for secondary analysis.

Candidate should safeguard participant's privacy and confidentiality. Candidate should inform participants how their provided data will be deployed in the research, and how and how long the data will be safely kept.

**Informed Consent** Researchers must accordingly obtain appropriate informed consent assure the voluntary capacity of the participant by providing sufficient opportunity to consider whether or not to participate, and minimizing the possibility of coercion, undue influence, or harassment.



**Parental Consent** The candidate should be to seek written consent from parents and to obtain assent from students themselves for research involving children under 18, even in cases where children were able to decline participation.

**Privacy and Confidentiality** of Data Researchers must maintain the confidentiality of data related to individual research participants. Except by public observation, researchers should clearly indicate the purpose of the collection of data and the method to ensure the confidentiality of collected data. Researchers must also avoid use of any personal identifiers such as individual names and addresses in their research reports which could lead to the human participants being identified.

**Benefits** Prospective participants should not be adversely induced by financial reward or be pressured to participate in research. All reimbursement of expenses, such as traveling expenses, should be commensurate with standard practice and be reasonable.

**Studies Involving External Parties** If an external party is involved in co-organizing the research project (e.g. in recruitment or data collection), a formal contract/letter of agreement or consent form should be signed before commencement of the project, and such document should be submitted together with the ethical application.

#### **APPROVAL PROCESS**

**Approved:** A letter of approval will be issued to the PI with indication of the ethics approval period granted.

**Conditionally Approved:** The approval letter will be issued with comments/concerns need to be satisfactorily addressed.

**If Approval is Not Given:** The Committee will specify its comments/recommendations on the notification to the PIs of protocols which are not approved.

**Reconsideration of Decision:** The Committee will further consider the resubmitted proposals according to the Committee's recommendations.

The formats and guidelines for the various R&D activities as envisaged in the aforesaid provisions made in this document shall be prepared and approved by the competent academic bodies of the University from time to time. The approved guidelines are shared with the faculty time to time.

Dean R & D

KLE Technological University, Hubballi





## Minutes of

### Institutional Ethical Committee Meeting

March 6<sup>th</sup>, 2020

The following are the minutes of the Institutional Ethical Committee Meeting of KLE Technological University, Hubballi, which was held on 6<sup>th</sup> March 2020 at 11.00 am, at the Senate Hall of the university.

#### Details of the Members:

Sr. No	Name	Position	Designation
01	Dr. Uma Mudenagudi	Chairman	Dean (R&D), KLE Technological University, Hubballi-580031
02	Dr.Sanjay Kotabagi	Member	Dean- Student Welfare Dean- Student Affairs, HoD-Humanities & Social Sciences, KLE Technological University.
03	Prof. S. R. Mahadeva Prasanna	Member	Dean (Faculty Welfare) Dean (Research & Development), IIT Dharwad.
04	Smt. Ottilie Kamal Anban Kumar	Member	Director eklakshay, C Lite Building, KLE CTIE, Hubballi.
05	Smt. Malavika Kadakol	Member	CEO, Rapid India , Dharwad.
06	Adv. Sujata Laxmeshwar	Member	IP Legal Counsel, Intellectual Property Facilitation Centre (IPFC), KLE Technological University.
07	Dr.A.H.M.Viswanathaswamy	Member	Professor, KLE College of Pharmacy Vidyanagar, Hubballi - 580 031.
08	Dr.Basavaraj S. Hungund	Member Secretary	Professor and Head, Department of Biotechnology, KLE Technological University

#### Invited Members:

- 1) Invited members (Internal)
- 2) Invited members (External)

Dr. Basavaraj S. Hungund  
Member Secretary  
Institutional Ethical Committee

Dr. Uma Mudenagudi  
Dean(R&D)



## Agenda

Item No.	Particulars
IEC 4.1	To introduction of the members of Institutional Ethical Committee ( IEC)
IEC 4.2	Discussion on Ethical Review Policy & guidelines and Formats of KLE Technological University.
IEC 4.3	To review and approve the applications received for the permission for studies on human subjects.
IEC 4.4	Any other matter related to the subject

IEC 4.1	<p>Introduction of the honourable members of IEC.</p> <p><b>Resolution:</b></p> <p>Member Secretary welcomed the honourable members and gave brief introduction of individual members.</p>
IEC 4.2	<p><b>Discussion:</b> Discussion on Ethical Review Policy &amp; guidelines and Formats of KLE Technological University.</p> <p>The ethical review policy and guidelines prepared from the input of the honourable members were presented by the member secretary and sought the suggestions from the members.</p> <p><b>Resolution:</b></p> <p>It is resolved to approve the Ethical Review Policy &amp; guidelines in the present form.</p>
IEC 4.3	<p><b>Agenda:</b></p> <p>To review and approve the applications received for the permission for studies on human subjects.</p> <p><b>Resolution:</b></p> <p>No applications were received from any of the research group or Department / School. Hence the committee decided to review any such applications in the next meeting.</p>
IEC 4.4	<p>The meeting was concluded by giving vote of thanks for all the members for their consent and active participation.</p>



Institutional Ethics Committee Meeting

March 6<sup>th</sup>, 2020

Attendance Sheet

Sr. No	Name	Position	Signature
01	Dr. Uma Mudenagudi	Chairman	
02	Dr.Sanjay Kotabagi	Member	
03	Prof. S R Mahadeva Prasanna	Member	
04	Smt. Otilie Kamal Anban Kumar	Member	
05	Smt. Malavika Kadakol	Member	
06	Adv. Sujata Laxmeshwar	Member	
07	Dr.A.H.M.Viswanathaswamy	Member	
08	Dr.Basavaraj S. Hungund	Member Secretary	







**Research and Development**

**Research Advisory Committee**

Following are the members of Research Advisory Committee

SN	Name	Designation	Institute	Role
1	Dr.Uma Mudenagudi	Professor, Dean R&D	KLE Technological University	Chairman
2	Dr.Mahadev Prasanna	Professor	IIT Dharwad	Member
3	Dr.Deepak T	Assistant Professor	IIIT Dharwad	Member
4	Dr.Rajashekar Bhajantri	Professor	Karnataka University Dharwad	Member
5	Dr.B S Anami	Principal	KLE Institute of Technology	Member
6	Dr.P G Tewari	Principal	BVB college of Engineering	Member
7	Dr.B B Kotturshettar	HoD Mechanical, Dean Planning & Development	KLE Technological University	Member
8	Dr.G H Joshi	Professor & HoD CEER	KLE Technological University	Member
9	Dr.P S Hiremath	Professor	KLE Technological University	Member
10	Dr.Shrinivas Desai	Associate Professor	KLE Technological University	Member Secretary

Registrar

**KLE Technological University**

**REGISTRAR**  
**KLE Technological University**  
**HUBBALLI-580 031**



## Research and Development

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### Agenda

Item No.	Particulars	Page No
RAC 1.1	Welcome to all members	
RAC 1.2	Introduction - University and Research	
RAC 1.3	Objectives of Research Advisory Committee	
RAC 1.4	Discussion on DSIR Application	
RAC 1.5	Discuss and approve the list of equipments to be procured for R&D activity	
RAC 1.6	Any other matter related to the subject.	



## Research and Development

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### **RAC 1.1 Welcome to all members**

Dr.Uma M, Dean R&D, Chairperson, welcomed all the members of Research Advisory Committee.

### **RAC 1.2 Introduction - University and Research**

Dr.Uma M, Dean R&D, Chairperson, presented milestones of KLE Technological University, Recognition, Awards and Research promotion schemes of the university.

### **RAC 1.3 Objectives of Research Advisory Committee**

Objectives of Research Advisory Committee is presented and discussed in the meeting. Following objectives of RAC is approved by the committee.

1. To review and approve the purchases for R&D purpose under R & D grants.
2. To review the progress of Research publications

### **RAC 1.4 Discussion on DSIR Application**

Updates of DSIR Application is presented to the committee.

KLE Technological University, Hubballi, Karnataka other than hospital is registered with Department of Scientific & Industrial Research (DSIR) for purposes of availing Customs Duty exemptions.

Registration is valid up to 31.08.2023.

### **RAC 1.5 Discuss and approve the list of equipments to be procured for R&D activity**

Equipments / softwares to be procured for research and development is presented to the committee. Summary of the same is presented in below table. Details are presented in Annexure I



## Research and Development

S.No	School / Dept	Equipment / Software	Amount in Rs.
1	School of Mechanical Engineering	Altair HyperWorks2019.v Paid-up license-Mechanical Research Edition with ST Inspire 05 Users(150HWU)	20,71,823.00 (5 Users)
2	School of Mechanical Engineering	Web based 3D experience tool license – Collaborative Business & Industry for Education LARGE – UXC –L AC	6,50,160 .00 ( 300 Users)
3	CIPD	Equipments, Softwares for Bionic Research Group	19,35,404.55
4	CIPD	IP Facilitation Cell	4,47,850.00
5	CIPD	Smart Campus industry 4.0 compliant Miniature Lab equipment	2,80,000.00
6	EEE	OP4510 (OPAL-RT real-time simulator)	15,11,569.00
7	CVG	DSLR camera 5D Mark 4 – kit lense	2,50,000.00

**Research Advisory Committe discussed and approved all the equipments and softwares as mentioned in above table to enhance Research & Development work.**

**RAC 1.6 Any other matter related to the subject.**

Committee discussed about plans for purchasing equipments with longer shelf life in near future



Research and Development

**Research Advisory Committee Meeting No. 1**

Date & Time: 24 - 09 - 2020, 4 PM

Venue: Meeting Hall, Main Building

SN	Name	Designation	Institute	Sign
1	Dr. Uma Mudenagudi	Professor, Dean R&D	KLE Technological University	
2	Dr. Mahadev Prasanna	Professor	IIT Dharwad	
3	Dr. Deepak T	Assistant Professor	IIIT Dharwad	
4	Dr. Rajashekar Bhajantri	Professor	Karnataka University Dharwad	
5	Dr. B S Anami	Principal	KLE Institute of Technology	
6	Dr. P G Tewari	Dean Academics	BVB college of Engineering	
7	Dr. B B Kotturshettar	Dean Planning & Development	KLE Technological University	
8	Dr. Ravi Guttal	Director, Center for Innovation and Product Development	KLE Technological University	
9	Dr. P S Hiremath	Professor	KLE Technological University	
10	Dr. Shrinivas Desai	Associate Professor	KLE Technological University	
11	Dr. N. H. Ayappa	Registrar	—	





# Guidelines to use URKUND and TURNITIN Plagiarism software

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**Turnitin** is an American commercial, Internet-based, closed-source plagiarism detection service.

**Turnitin** is an originality checking and plagiarism prevention service that checks writing for citation mistakes or inappropriate copying. When the students / faculty submit paper, **Turnitin** compares it to text in its massive database of faculty / student work, websites, books, articles

Link: <https://www.turnitin.com>

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**Urkund is a fully-automatic machine learning text-recognition system made for detecting, preventing and handling plagiarism, no matter which language you are writing in.**

Urkund is an easy and effective tool to trust. It is a straightforward and accurate and provide quick and able to delve into any interesting findings while also avoid spending time on irrelevant false positives. The analysis report that is the result of each document submitted is intuitive and easy to get an overview with.

The individual accounts are created for all the faculty members and research scholars of KLE Tech. The individual emails have been sent to all faculty members of our university from URKUND Team. Please follow the procedure given in the email to check the plagiarism of your documents. The procedure is as follows:

A document intended to be checked should be e-mailed as an attached file to analysis address (Ex. Of mine: [prakashpatil.kletec@analysis.urkund.com](mailto:prakashpatil.kletec@analysis.urkund.com)) which is given in the email sent by the URKUND and the same is connected to your personal e-mail (Ex of mine: [prakashpatil@kletech.ac.in](mailto:prakashpatil@kletech.ac.in)) and reports will be sent your email account when they are ready.

Dear Sir/ Madam,

We are pleased to inform you that URKUND Plagiarism Detection Software (by M/s Prio Infocenter AB- Sweden, through eGalactic) is being rolled out to our university through centrally funded scheme from MHRD to enhance quality and prevent plagiarism in research / academic publications.

The services are now available for KLE Technological University. Now all faculty members and research scholars shall use this URKUND Software to check the plagiarism.

The individual accounts are created for all the faculty members and research scholars of KLE Tech. The individual emails have been sent to all faculty members of our university from URKUND Team. Please follow the procedure given in the email to check the plagiarism of your documents. The procedure is as follows:

1. A document intended to be checked should be e-mailed as an attached file to analysis address (Ex. Of mine: [prakashpatil.kletec@analysis.orkund.com](mailto:prakashpatil.kletec@analysis.orkund.com) ) which is given in the email sent by the URKUND and the same is connected to your personal e-mail (Ex of mine: [prakashpatil@kletech.ac.in](mailto:prakashpatil@kletech.ac.in)) and reports will be sent your email account when they are ready.

### **Guidelines for usage of URKUND and TURNITIN Plagiarism software**

1. The services of TURNITIN software is also continued to faculty members and research scholars of KLE Tech to check the plagiarism.
2. I request the faculty members to use TURNITIN software only to check important documents like research papers, thesis and other important research articles.
3. Initial plagiarism checks can be made on URKUND software and only final plagiarism checks can be made in TURNITIN so that we can use both software on economical basis so that we can keep the TURNITIN subscription charges at minimum level.
4. URKUND software can be used to check all internal academic documents such as minor / major / capstone project reports, seminar reports, assignments etc.

I request all faculty members to follow the above guidelines for usage of Plagiarism software.

With best wishes!!

-

--

Prof.P.R.Patil  
Professor and Head  
Department of MCA  
KLE Technological University,Hubballi  
[www.kletech.ac.in](http://www.kletech.ac.in)  
Email: [hod\\_mca@kletech.ac.in](mailto:hod_mca@kletech.ac.in)  
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 PAN: AAGCT1132P

Date: Nov 27, 2019  
 Invoice No.: IND12000506  
 Purchase Order No.: KLE-Tech/PUR/TURN/2019-20/  
 Sales Order No.: SO934806  
 Due Date: Dec 12, 2019  
 Payment Terms: Net 15  
 Service Start: Oct 03, 2019  
 Service End: Sep 30, 2020

**TAX INVOICE**

Bill To	Billing Contact	Account Manager
GSTIN 29AACAK9702A1ZV KLE Technological University BV Bhoomaraddi College Campus Vidyanagar Hubli, Karnataka 580 031 India  Our Ref: CN-192952 106048	Patil, Prakash Associate Professor e: prakashpatil@bvb.edu t: 919448821697 f:	Debapriya Mukherjee e: dmukherjee@turnitin.com f: 1-510-764-7612

Product Name	Product Description	Amount
Originality Check for Faculty/Research Scholar - Prtl w/ Stud	284 Faculty. Includes Translated Matching, Integration, e-Rater - Single-campus Enterprise Subscription	INR 267,389.84
Originality Check for Students	4560 Add-on Student license. Includes Translated Matching, Integration, e-Rater - Single-campus Enterprise Subscription	INR 289,986.78
	Subtotal	INR 557,376.62
	CGST - 0%	INR 0.00
	SGST - 0%	INR 0.00
	IGST - IN 18%	INR 100,327.79
	UTGST - 0%	INR 0.00
	Total	INR 657,704.55

Total Invoice Amount In Words: Six Hundred Fifty Seven Thousand Seven Hundred Four Point Five Five

USD\$ : 9,216.97 = INR 657,704.55

Exchange Rate US \$1.00 = INR 71.358

SAC code 998439

Please refer to the quote and/or proforma invoice for details of quantity and descriptions of services provided.

Invoice is system generated and thus does not need a signature

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Remit Cheque Payment to:	TurnitIndia Education Private Limited Max Towers, 16th Floor, Spaces, Suites #1603-05, 1608, 1610 Sector 16-B, NOIDA - 201301 Uttar Pradesh, India
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India  
201301  
1-510-764-7600  
GSTIN: 09AAGCT1132P1Z1  
PAN: AAGCT1132P

Date: Nov 27, 2019  
Invoice No.: IND12000506  
Purchase Order No.: KLE-Tech/PUR/TURN/2019-20/  
Sales Order No.: SO934806  
Due Date: Dec 12, 2019  
Payment Terms: Net 15  
Service Start: Oct 03, 2019  
Service End: Sep 30, 2020

Wire Instructions:	<ol style="list-style-type: none"><li>1) BENEFICIARY BANK: Citibank N.A. BENEFICIARY COMPANY: TurnitIndia Education Private Limited BENEFICIARY COMPANY'S ACCOUNT #: 0714093002 BENEFICIARY BANK BRANCH IFSC CODE: CITI0000002 BENEFICIARY BANK BRANCH MICR CODE: 110037002 BENEFICIARY BANK SWIFT CODE: CITIINBX</li><li>2) Request that your originating bank reference your invoice number. If you do not have an invoice number, please request that your originating bank reference the name of your institution and your location.</li><li>3) Email ar@turnitin.com with the confirmation that the transaction has been completed</li></ol>
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GSTIN: 09AAGCT1132P1Z1  
PAN: AAGCT1132P

Date: Oct 17, 2020  
Invoice No.: IND12001198  
Purchase Order No.: No./KLE/Tech-PUR/TURN/2020-21/2376  
Sales Order No.: SO948530  
Due Date: Nov 01, 2020  
Payment Terms: Net 15  
Service Start: Oct 03, 2020  
Service End: Oct 02, 2021

### TAX INVOICE

Bill To	Billing Contact	Account Manager
GSTIN 29AACAK9702A1ZV KLE Technological University BV Bhoomaraddi College Campus Vidyanagar Hubli, Karnataka Karnataka 580 031 India  Our Ref: CN-192952 106048	Patil, Prakash Associate Professor e: prakashpatil@bvb.edu t: 919448821697 f:	Debapriya Mukherjee e: dmukherjee@turnitin.com f: 1-510-764-7612

Product Name	Product Description	Amount
TFS-GROWTH	Turnitin Feedback Studio: Originality Checking and Feedback for 3122 EUL's	INR 646,298.40
	Subtotal	INR 646,298.40
	CGST - 0%	INR 0.00
	SGST - 0%	INR 0.00
	IGST - IN 18%	INR 116,333.71
	UTGST - 0%	INR 0.00
	Total	INR 762,632.11

Total Invoice Amount In Words: Seven Hundred Sixty Two Thousand Six Hundred Thirty Two Point One One

USD\$ : 10,384.00 = INR 762,632.11

Exchange Rate US \$1.00 = INR 73.443

SAC code 998439

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PAN: AAGCT1132P

Date: Oct 17, 2020  
Invoice No.: IND12001198  
Purchase Order No.: No./KLE/Tech-PUR/TURN/2020-21/2376  
Sales Order No.: SO948530  
Due Date: Nov 01, 2020  
Payment Terms: Net 15  
Service Start: Oct 03, 2020  
Service End: Oct 02, 2021

Wire Instructions:	<ol style="list-style-type: none"><li>1) BENEFICIARY BANK: Citibank N.A. BENEFICIARY COMPANY: TurnitIndia Education Private Limited BENEFICIARY COMPANY'S ACCOUNT #: 0714093002 BENEFICIARY BANK BRANCH IFSC CODE: CITI0000002 BENEFICIARY BANK BRANCH MICR CODE: 110037002 BENEFICIARY BANK SWIFT CODE: CITIINBX</li><li>2) Request that your originating bank reference your invoice number. If you do not have an invoice number, please request that your originating bank reference the name of your institution and your location.</li><li>3) Email ar@turnitin.com with the confirmation that the transaction has been completed</li></ol>
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Date: 05-10-2020

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Noida-201301, Uttar Pradesh. India


Sub: **Renewal Order** for Subscription of **Anti Plagiarism Web Tool- Turnitin**  
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With reference to the above cited subject, I am pleased to place herewith the renewal order for subscription of **Anti Plagiarism Web Tool- Turnitin FeedBack Studio software** for the period of **1<sup>st</sup> Oct. 2020 to 30<sup>th</sup> Sept. 2021** to this University. Accept the same and continue the services. The detail is as below.

Service Description & Subscription Details	Qty	Amount in USD (\$)
<b>Turnitin Originality Check &amp; Single Campus Enterprise Subscription 12M-2 Step Growth plan (for Maximum End User License 3122 )</b>	1	8,800
	+GST @ 18%	1,584
	<b>G Total</b>	<b>10,384.00</b>

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GSTIN	29AACAK9702A1ZV
SERVICE TAX REG NO.	AACAK9702ASD001
PAN	AACAK9702A
CUSTOMER STATE	Karnataka
STATE CODE	KA

  
REGISTRAR



Ref: No./KLE-Tech/PUR/TURN/2018-19/ 989

Date: 05-10-2018

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Service Description	License Fee Description	Qty	Amount in USD (\$)
Turnitin License Administration Fee	License Administration Fee	1	3000.00
Feedback Studio for Faculty/ Research Scholar- Partial	Turnitin Feedback Studio for Faculty/Research Scholars: Originality Checking, Feedback, and Integration	65	3600.00
Feedback Studio for Students	Turnitin Feedback Studio for Students: Originality Checking, Feedback, and Integration	170	850.00
			7450.00
		+GST 18%	1341.00
		<b>G Total</b>	<b>8791.00</b>

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## KLE Technological University, Hubballi

01-Mar-2016 - 28-Feb-2017 ▾

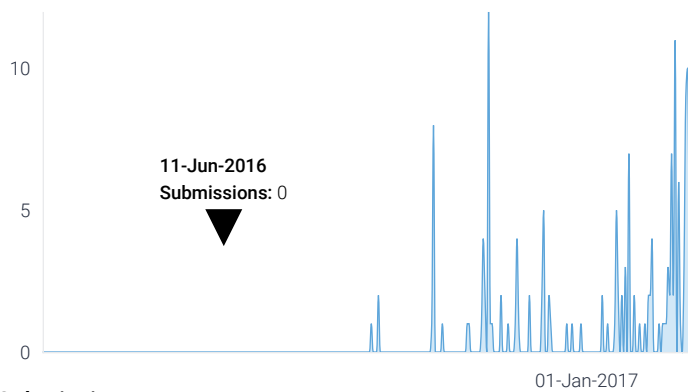
## Full Report

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## Overview

### Submissions



### Most Submissions

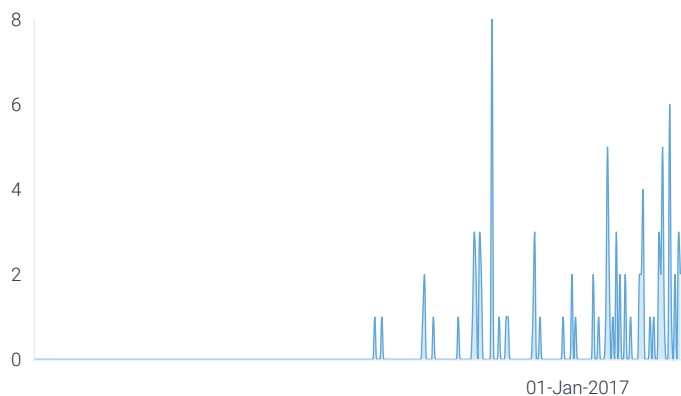
Class	Submissions
"BVB" 14514961	47

Class	Submissions
"test" 13750489	39
"PhD" 14060894	12
"Embedded Systems-5B" 13950682	11
"CCN" 13944937	8

High Similarity Threshold:

≥ 20%

**High Similarity Reports\***



**Most High Similarity Reports\***

Class	High Similarity Reports
"test" 13750489	23
"BVB" 14514961	10
"Embedded Systems-5B" 13950682	9
"CCN" 13944937	7
"PhD" 14060894	7

\*This count reflects all activities that trigger report generation.

## Submissions with Feedback



## Most Submissions with Feedback

Class	Submissions with Feedback
"Embedded Systems-5B" 13950682	2
"test" 13750489	0
"Biomedical instrumentation" 13882191	0
"Ban1" 14528602	0
"AB" 13944868	0

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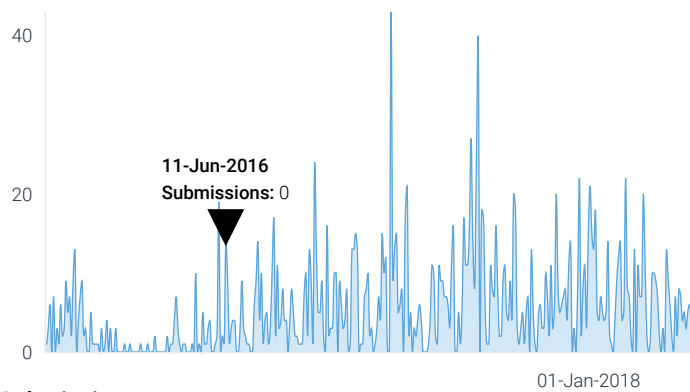
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## Overview

### Submissions



### Most Submissions

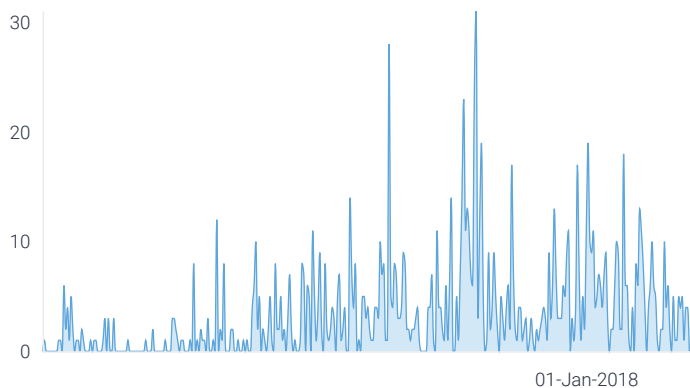
Class	Submissions
"CC"	169
16891319	

Class	Submissions
"BVB" 14890626	148
"SH" 16205444	126
"RESEARCH DATA" 16178099	123
"MBA 2016-18" 16656279	102

High Similarity Threshold:

≥ 20%

**High Similarity Reports\***

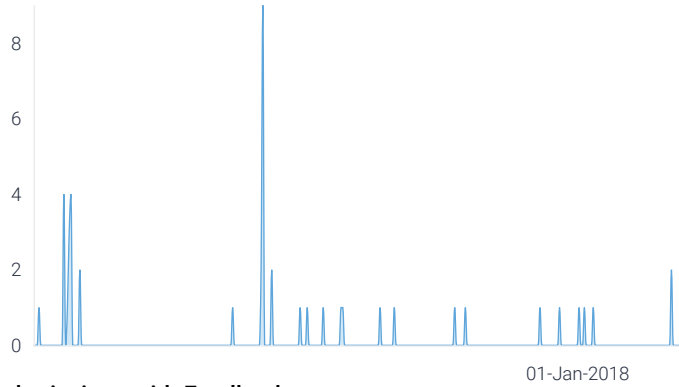


**Most High Similarity Reports\***

Class	High Similarity Reports
"CC" 16891319	107
"MBA 2016-18" 16656279	79
"RESEARCH DATA" 16178099	75
"Ph.D." 16571302	72
"SH" 16205444	59

\*This count reflects all activities that trigger report generation.

### Submissions with Feedback



### Most Submissions with Feedback

Class	Submissions with Feedback
"BVB" 14890626	30
"BVB" 15792161	5
"PG" 15992926	4
"Image Processing" 16931387	1
"MBA 2016-18" 16656279	1

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## KLE Technological University, Hubballi

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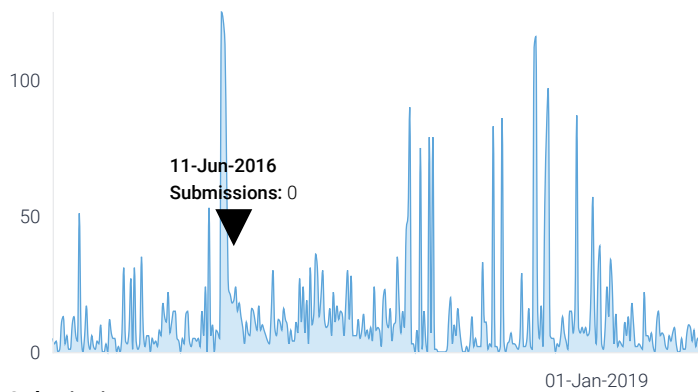
## Full Report

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## Overview

### Submissions



### Most Submissions

Class	Submissions
"Thesis" 16807974	755

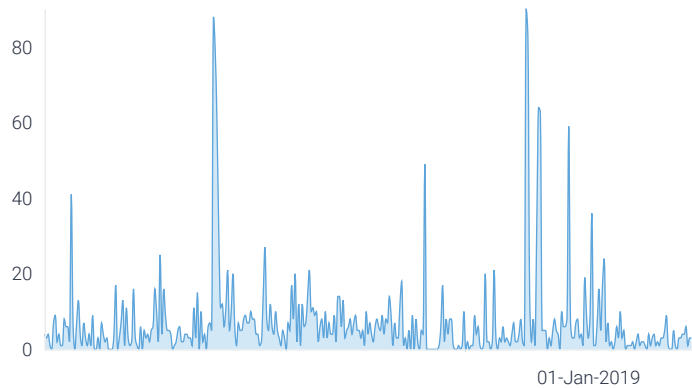


Class	Submissions
"TEMP" 19733964	584
"Dummy" 18179198	503
"FIE" 18283148	261
"Thesis" 19944256	261

High Similarity Threshold:

≥ 20%

**High Similarity Reports\***

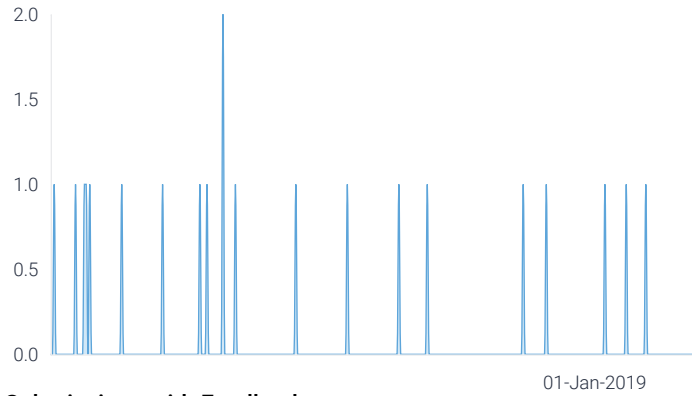


**Most High Similarity Reports\***

Class	High Similarity Reports
"TEMP" 19733964	384
"Dummy" 18179198	263
"Thesis" 16807974	179
"FIE" 18283148	146
"Phd" 17730635	134

\*This count reflects all activities that trigger report generation.

### Submissions with Feedback



### Most Submissions with Feedback

Class	Submissions with Feedback
"physics" 17530288	7
"BVB" 14890626	3
"miniproject" 19810603	2
"RESEARCH DATA" 16178099	2
"TEMP" 19733964	1

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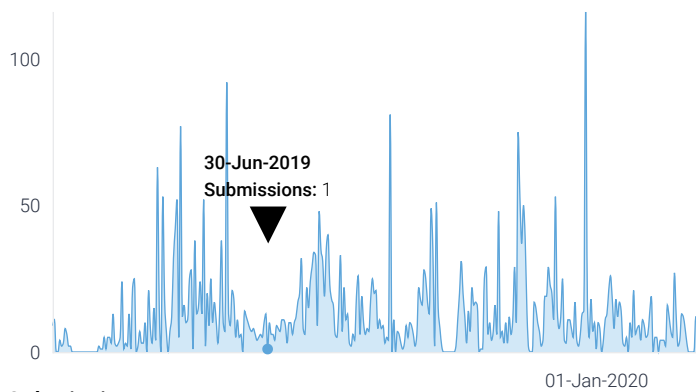
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## Overview

### Submissions



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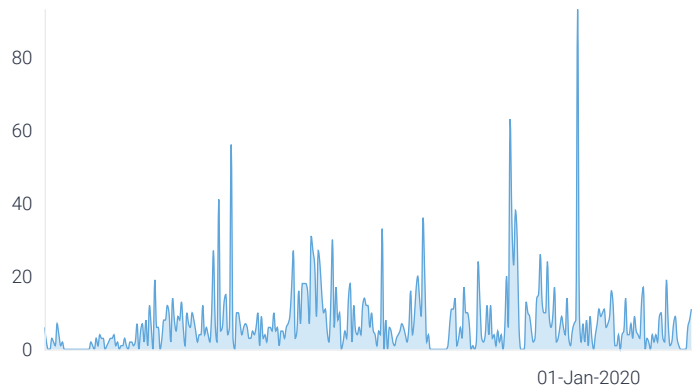
Class	Submissions
"CEER" 22093608	669

Class	Submissions
"EC" 21011093	451
"NRPatil" 21059789	359
"MCA" 13578195	341
"Thesis" 19944256	323

High Similarity Threshold:

≥ 20%

**High Similarity Reports\***

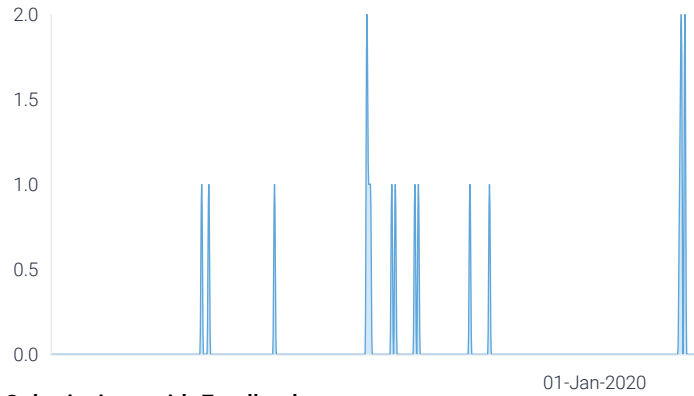


**Most High Similarity Reports\***

Class	High Similarity Reports
"CEER" 22093608	472
"MCA" 13578195	277
"NRPatil" 21059789	266
"EC" 21011093	249
"KLE Tech." 22896887	120

\*This count reflects all activities that trigger report generation.

### Submissions with Feedback



### Most Submissions with Feedback

Class	Submissions with Feedback
"SVB" 23964717	5
"BVB" 14890626	5
"HPC" 20025553	2
"MBA 2016-18" 16656279	1
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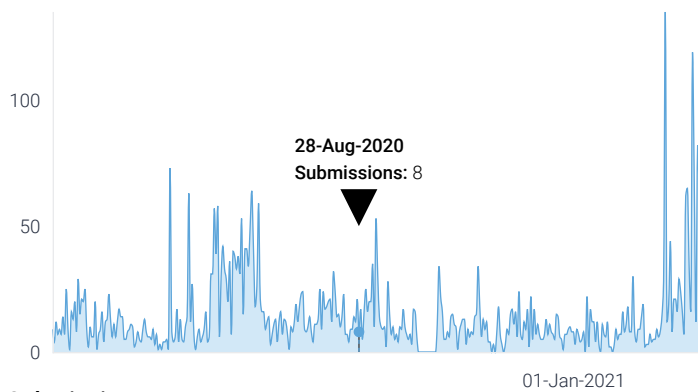
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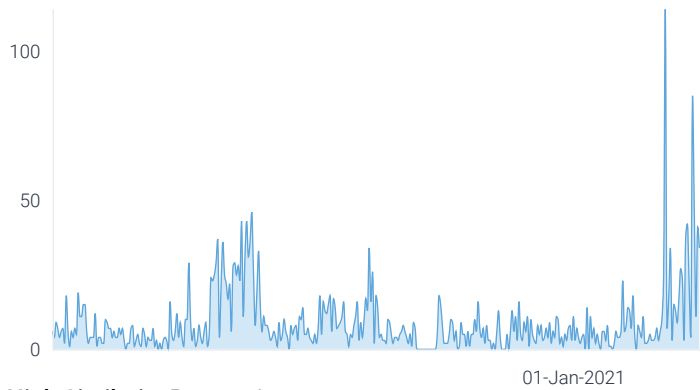
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25264582	

Class	Submissions
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"CEER" 25307150	306
"MCASTAFF" 24105901	291
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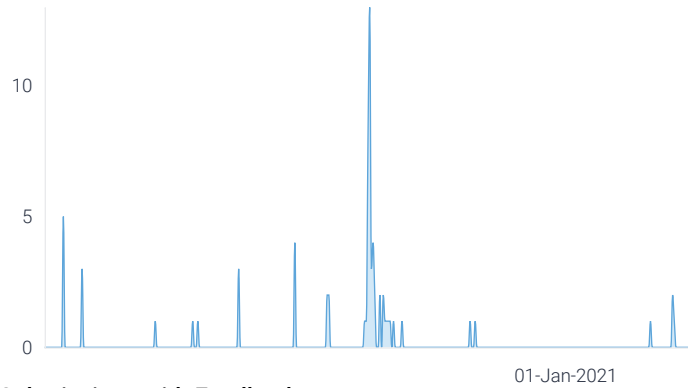


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"CEER" 25307150	209
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106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-05-2017	20	6	42	41	1	13	14	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-09-2017	73	19	218	244	3	135	70	29	7	2	0	121	1	0	0	1	0	0	1	0	1	0	119	0	0	0	0	0	0	0	
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106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-11-2017	45	15	214	241	7	130	64	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-12-2017	45	15	202	213	10	94	70	28	11	2	0	31	1	0	0	1	0	0	1	0	1	0	29	0	0	0	0	0	0	0	
106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-01-2018	62	15	254	301	9	130	119	30	13	3	0	379	3	0	0	0	0	0	0	0	0	0	0	376	0	0	0	0	0	0	
106048	KLE Technological University, Hub Account	106048	KLE Technological University, Hubballi	01-02-2018	41	13	158	182	1	98	65	14	4	2	0	425	2	0	0	0	0	0	0	0	0	0	0	423	0	0	0	0	0	0	



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106048	KLE Technological University, Hubballi	Account	106048	KLE Technological Un	01-12-2019	25	13	511	496	6	214	193	66	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106048	KLE Technological University, Hubballi	Account	106048	KLE Technological Un	01-01-2020	27	13	298	280	16	98	106	40	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106048	KLE Technological University, Hubballi	Account	106048	KLE Technological Un	01-02-2020	28	13	200	187	3	75	81	21	7	5	0	632	5	0	0	0	0	0	0	0	0	0	0	0	0	627	0	0	0	0	0	0	0	0



# RA

*by* Shivanand Prabhuswamymath

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**Submission date:** 20-Feb-2020 11:28AM (UTC+0530)

**Submission ID:** 1260684075

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# Factors Influencing ICT Adoption in SMEs

## ABSTRACT

Upliftment of Economy, new job creation, industrialization of small regions, removing economic disparity and improving social development of underdeveloped areas are the result of contribution from the **small and medium-sized enterprises (SMEs) Sector**. Information and Communications Technology (ICT) has given leverage to SME sector through which they can compete with global industries and cope up with market conditions. Present stage of small industries demand the usage of ICT in their work activities to improve productivity and bring quality into the products. In India different studies about ICT usage in SMEs show that, the factors affecting the ICT implementation in a holistic approach is missing and also the list of factors is not elaborate to include all the parameters. The focus of this research work is to find the factors that affect ICT implementation in SMEs, establish relationship between SMEs performance and ICT adoption and to suggest a conceptual framework for SMEs to adopt ICT. Data was collected for 100 SMEs through questionnaire design covering the all the identified factors and analysis was done through Statistical Package for Social Sciences (SPSS) software. The research work revealed that ICT is important for SMEs to enhance their performance. Organizational management (Internal Factor) concentrating on employee skills, Extraneous and Stability conditions (External Factor) focusing on the demographic existence are the critical determinants for ICT adoption. Internal factors can be controlled by the organizations themselves, whereas the external factors need to be taken care by the Government agencies and industrial associations. The purpose of this research work was to identify both external and internal factors that affect ICT adoption and to analyze the factors and their impact on organizational performance.

**Keywords**—SMEs, ICT, Manufacturing Industries, Factor Analysis

## I. INTRODUCTION

Dynamic shift has taken place from agricultural activities to non agricultural activities due to industrialization and a nation's development is owed to industrial development in that region. **Micro, Small and Medium Enterprises (MSME) sector** has great contribution to Indian economy post independence. MSMEs provide huge employment opportunities, serve as ancillary units to large organizations, uplift rural and backward areas. Definition of Small and Medium Enterprises (SMEs) vary from country to country. As per Henry Ongori [1], based on employee strength the SMEs definition for different countries is as shown in the Table.1

**Table.1: SME definition based on Employee Strength**

Country Name	Australia	Indonesia	Kenya	India
Employee Strength	5-199	5-99	11-99	10 to 100

*(Source: Various publications of Ministry of MSMEs in India, 2019)*

Small Scale Industries (SSI) took care of industrial sector constituting tiny and auxiliary units before the new definitions of SMEs was given in terms of investment and number of employees in India as per **Micro, Small and Medium Enterprises Development (MSMED) Act, 2006**. There is a healthy and progressive growth in number of Enterprise Memorandum (EM)-II filings from 2007-08. There are 2003673 Micro, 228008 Small and 8781 Medium enterprises as per MSME 2018 annual report and out of these 9,93,000 are in manufacturing and 12,53,000 in service sector. There is a constant growth rate, as per Planning Commission, Government of India (GoI), 2017[2] considering the contribution to Gross Domestic Product (GDP) from the industry sector, which constitute Indian economy, from the year 1950-2014. SMEs has great role in contributing to Gross Domestic Product (GDP) and employment generation in India. Indian SMEs part right now contributes about 8% to the nation's GDP, however can possibly be a distinct advantage for the nation's economy. Manufacturing SMEs are key drivers of the Indian economy and their potential is yet to be tapped to the fullest extent. India has a wonderful chance to increase their contribution towards GDP by at least 50% from the current 8%. The manufacturing and service industries in India are grouped under the MSME (Micro, Small and Medium Enterprise) class based on their investment in plant and apparatus as appeared in Table. 2

**Table.2: Revised MSME Definitions**

Description	Manufacturing Sector	Service Sector
Micro Enterprises	Up to 50 Lakhs	Up to 20 Lakhs
Small Enterprises	Above 50 Lakhs and below 10 Crore	Above 20 Lakhs and below 5 Crore
Medium Enterprises	Above 10 Crore and below 30 Crore	Above 5 Crore and below 15 Crore

(Source: Various publications of DCSME including Small Scale Industries in India and National Statistics Department, 2019)

The SMEs are confronting numerous issues to develop and improve the economy by competing with global players. The administration perceives the significance of SMEs for the general improvement of the nation, and right now has set up to bridle the emitting issues related with them. The significant deterrent in the extension of SMEs is the inaccessibility of adequate assets to back their development. Measures proposed by the legislature would guarantee accessibility of sufficient assets to MSMEs to control their development. ICT is an extended term for information technology (IT). ICT in MSME Sector is one of the plans started by Government of India (GoI) to empower MSMEs to scan for value chain. ICT includes communication tools like digital equipments, mail, internet, intranets, video conferencing and fax machines (Todd Dewett.et.al., 2001 [3]). Huge investment for adopting ICT is taken up by SMEs to compete in globalised world by targeting quality products and services. (Morteza Ghobakhloo [4]). Scarcity of skilled human resources and capital resources hinder SMEs as compared to large organizations in implementing ICT.(Domenico Consoli [5]). Businesses today are giving more importance to ICT tools to carry out different tasks to meet customer requirements. (Kadadevaramath [6]).

## II. LITERATURE REVIEW

The literature shows that most of studies identified the barriers for ICT adoption in terms of internal and external barriers. Internal barriers concentrate on top management's willingness, skills of employees and external barriers focusing on government policies and uncertainty in the environment. The different barriers for adopting ICT by SMEs consolidated from the literature survey are listed in the Table.3 and Table.4

**Table.3: Indicators and Author References (Internal and External Factors)**

Morteza Ghobakhloo.et.al(2012)[4] Legal issues, Competitiveness of environment, Financial resources availability, Level of IT investment, External expertise and services availability and support, Users IT competence ,Users training, Users attitudes, Users participation and involvement, Organizational structure, Organizational culture
Domencio Consoli, (2012)[5] Political, legal and regulatory barriers, Public policies, Competitive pressure, customer innovative requirements, Infrastructure, Existing technological infrastructure, Adoption and implementation cost, Macroeconomic costs, Firm characteristics, Cultural barriers, Social barriers, high skills, learning by doing processes
Henry Ongori(2011)[1] Lack of support by government, Lack of infrastructure, Lack of human capital, Efficient, administration, control and accountability, Lack of financial resources
Abdel Nasser H. Zaid(2012)[7] Government policy, Competitive pressure, Lack of secure payment infrastructure, Lack of qualified staff
Kadadevaramath.et.al(2014)[6] Financial resources, Services availability and support, Consultant effectiveness and competence
Lucy Chairael.et.al(2015)[8] Financial resources, Orientation to strategy , coordination and the suitability, Knowledge and proficiency
Ali Akbar Farhanghi.et.al(2013)[9] Openness to learning best practices, Empowerment, High Profitability, Market share, customer satisfaction

(Source: Table generated by Author after literature survey)



**Table 4: Indicators and Author References (Organizational Performance)**

Firm profitability	A S. Maiga.et.al(2009) [10]
Productivity, product quality, customer satisfaction	Domencio Consoli, 2012[5]
Customer retention, Sales growth, Profitability	Eldon Y. Li.et.al(2006)[11]
productivity, cost reduction ,product quality ,product delivery	Lucy Chairael.et.al(2015)[8]
Increasing efficiency, improving customer service	Henry Ongori.et.al(2011)[1]

(Source: Table generated by Author after literature survey)

The different performance parameters to show the effectiveness of ICT adoption from the literature survey is shown in the table above .Extensive literature survey work was carried and lot of information was gathered from different sources like industry reports, journal papers and industry persons. From this, the exploration of secondary data is carried out. ICT has become necessity for the enterprises to sustain the external threat from the outside world. Barriers for ICT adoption were categorized into two main groups: internal factors and external factors. (Morteza Ghobakhloo [4]). SMEs in developing nations have to design mechanisms to eradicate barriers for ICT adoption. IT training for the proprietor/director can be utilized to defeat these obstructions. Inner hindrances can be settled inside the organization by the administration itself, while outside obstructions should be tended to either by government mediation or by SMEs mentors (Faitira Manuereet.et.al, 2012[12]).The literature survey reveals that technical, legal and regulatory barriers are very significant for ICT adoption by SMEs. E-commerce has high impact to channelize the enterprise customer base. SMEs have only adopted the basic ICT tools. Security and protection are basic issues that need to take the most elevated level of need in online business execution process. Making a uniform vital arrangement for web based business ventures is the initial step for effective selection of web based business. Resident's attention to online business and other new e-administrations need to be tended addressed (Abdel Nasser H. Zaied [7]).The procedure of selection of ICT is complex and it is accompanied by the following conditions: business conditions (affectability and responsibility of the top vital administration), hierarchal conditions (the nearness of an ICT Pivot: business visionary, supervisor, IT office representative or outer expert/merchant), the board conditions (a fitting presidium of ICT apparatuses by talented human resources).The examination of variables of ICT adoption and the effects on associations are essential to comprehend the way to invigorate the procedure of interest in new advancements to gain upper hands and great business exhibitions in SMEs(Domenico Consoli [5]).

### III.PROPOSED RESEARCH MODEL

The factors which have been identified from the literature survey are further defined as hypothesis statements for further testing. A hypothesis is an assumption, explaining an observation or scientific problem that can be tested by further observation, investigation and/or experimentation. In this study hypothesis was built between independent variables and the dependent variable organizational performance and was tested for adequacy. The hypotheses assume the relationship between the input variables and process factors. Both the input variables and process factors are tested for their relationship with output factors. The proposed conceptual model for the present research work involves four external and four internal barriers for ICT adoption. And 8 hypothesis statements were framed for the study. ie..Government Regulations, Extraneous and Stability, Capital Resources, Financial Management, Organization Management, Consultancy And Vendors, Strategic Planning, Facility Planning were considered as *Independent Factors* and Organizational Performance as *Dependent Factor*.

### IV.ANALYSIS OF DATA

#### a) Reliability Analysis

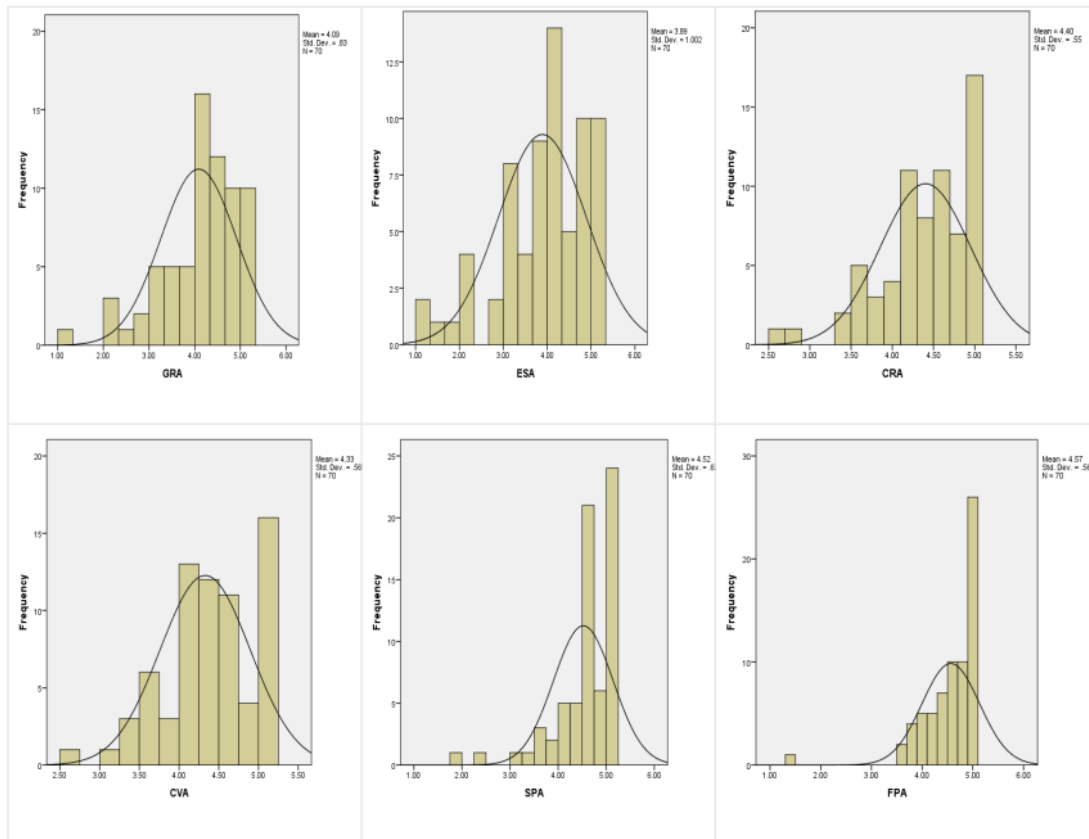
The most widely recognized way of internal consistency is Cronbach's alpha and is utilized with different Likert inquiries in a survey. The explanation behind estimating internal consistency is that the pointers of scale should quantify the same construct and parameters must be profoundly correlated. Cronbach's alpha is unwavering quality coefficient which looks at the whole scale consistency. Limits for Cronbach's alpha are 0.60 to 0.70 for exploratory research. The Cronbach's alpha for various builds are appeared in underneath Table 5.

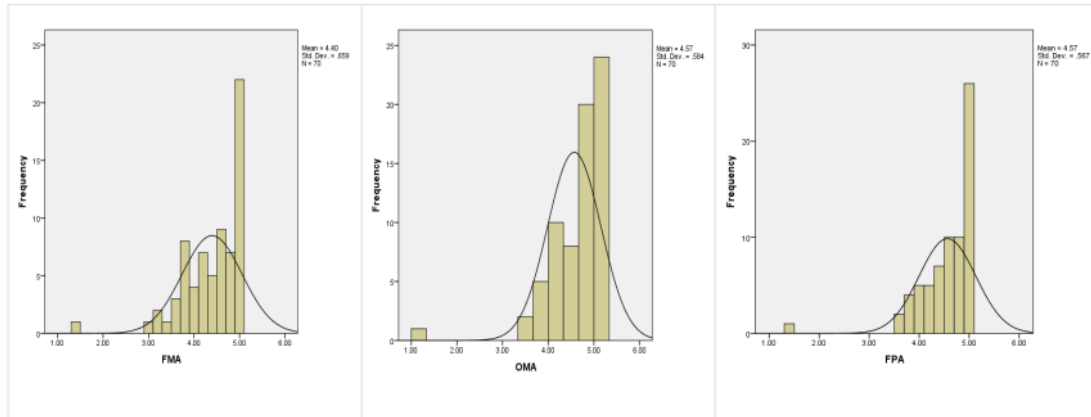
**Table 5: Cronbach's Alpha for different factors**

Government Regulations	0.846	Consultancy And Vendors	0.664
Extraneous and Stability	0.816	Strategic Planning	0.808
Capital Resources	0.540	Facility Planning	0.776
Financial Management	0.784	Organizational Performance	0.689
Organization Management	0.849	Overall	0.930

**b) Normality Test**

For many statistical analysis test for normality of data is a prerequisite as it is basic assumption in parametric testing which can be tested either graphically or numerically. An empirical measure of normality involves skewness and kurtosis. Normality test is taken up to examine whether the modeled dataset follows normal distribution or not. Value of Skewness varies from -2.573 to -0.716 Kurtosis values vary from -0.021 to 6.813 for all the indicators. Therefore all indicators are within the acceptable region of normality test. This is supported by (West et al., 1995) [13] who asserts that Skewness values and Kurtosis values for all the indicators should be less than 2 and 7. Figure.1 gives the normal distribution curve for each factor.





**Figure.1: Normal Distribution Curve for all Factors**

**c) Bivariate Correlation Analysis**

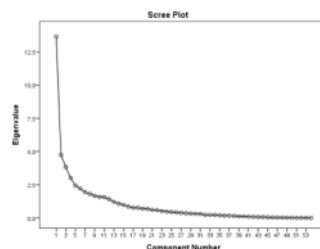
Basic relationship with respect to two indicators is depicted using Correlation coefficients. Two indicators may have either positive or negative correlation. Highest Correlation Coefficient was between Facilities Planning (FP) and Organization Management (OM). (0.804\*\*\*) i.e. well planned maintenance of machines and supporting facilities, well planned layout to aid flexibility, transparency and standardization motivate employee’s participation and involvement. Lowest Correlation Coefficient was between Government Regulations (GR) and Organization Management (OMI) (0.105), but both are significant factors for the ICT adoption process.

**d) Regression Analysis**

Regression analysis is used to understand association between selected variables. The coefficient of determination ( $R^2$ ) determined was 0.387. This gives an indication that 38.7% of variation in the dependent variable is justified by all the independent variables. Analysis of variance (ANOVA) states that the F statistic value is statistically crucial and right at a value of 4.812. This points out that all the independent variables are closely related to the dependent variable.

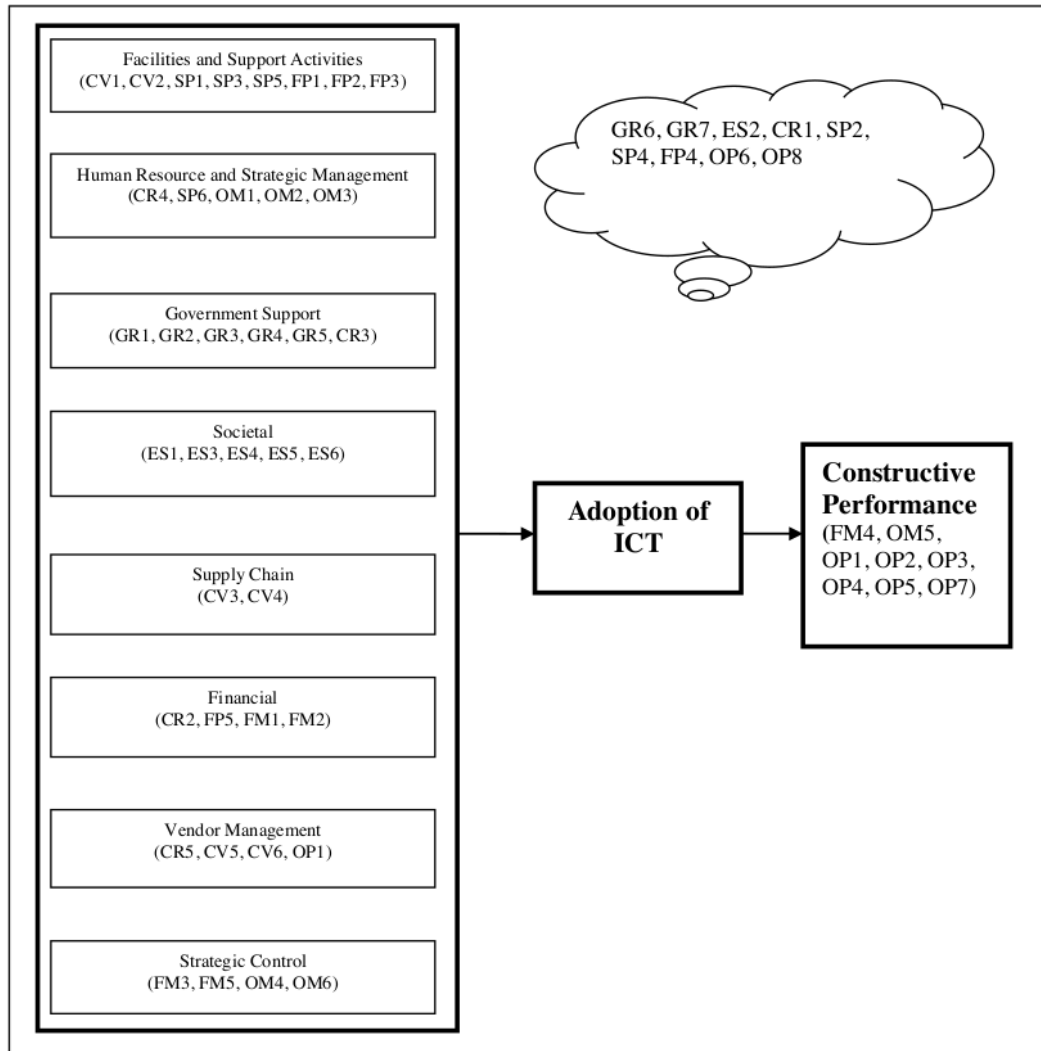
**e) Factor Analysis**

Multivariate analysis is used for model validation. Exploratory factor analysis is performed to examine the underlying structure of group of indicators. For factor analysis the threshold value of KMO is 0.5 and the value obtained was well near to the limit i.e. 0.530. Bartlett’s test of sphericity limiting value is 0.05 and the obtained value was 0.000 which is less than limiting value. Extraction of factors was carried through factor analysis with the principal component analysis method. Total variance of 65.37% explains the information contained in 9 factors. Total variance of 60% is the limiting value which is considered to be satisfactory in social sciences (Hair et al., 2003[14]). Rotation methodology for distribution for different factors was done as many variables were loaded onto more than one factor. In social sciences it is better if each variable is loaded to one factor by which interpretation of results will give more meaning in decision making. For 30 iterations rotation was converged and through this 9 indicators were deleted. To understand the most significant factor for variability of data Scree plots are plotted. After factor 7, line starts to straighten which states that 7 factors will give more information about variability of data as depicted in Figure No.2.



**Figure. 2 Scree Plot**

The regenerated model after factor analysis after deletion of 9 indicators with new factor names is depicted below.  
Figure.3



**Figure. 3 Regenerated Model**

### V.CONCLUSION

Regression analysis revealed that two hypothesis statements , ‘*Extraneous and Stability*’ and ‘*Organisational Management*’ influences organizational performance of SMEs. Remaining six hypothesis statements were rejected asserting that *Government Regulations, Capital Resources, Consultants and Vendors, Strategic Planning, Facilities Planning and Financial management* are not the critical barriers for ICT adoption by SMEs as the p-values were not significant.

## VI.HIGHLIGHTS OF THE RESEARCH

1. **Independent Internal** controlled factors are the drivers for ICT implementation in manufacturing SMEs in the tier 2 cities.
2. **Quality Dominates Quantity** in present scenario of industrial exploration
3. **Extraneous and stability** conditions will have 'long term effect' on the adoption and implementation of ICT.
4. **Formal training** to the employees would always enhance the ICT acceptance and usage.
5. **Supportive policies and regulations** (GoI) cause constructive technological up gradation in an organization.
6. **'Supportive & Dedicated Infrastructure'** with ICT would improve performance.

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# Automatic Traffic Rule Violation Detector

Auto-TRuVID

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**Abstract**—With human race rapidly evolving in all domains, be it research, medicine, culinary arts or transportation there is a constant need of updation and demand for new trends. Narrowing it down, the road safety standards have taken effective measures over the past decade. But it also comes with some pros and cons. With the word ‘automation’ adding up to all disciplines, there is an acute need for the road safety and traffic officers to amend digitally. Hence AUTO-TRuVID, a automatic traffic rule violation detector, a prototype capable of detecting selected rule violations by the driver and alerting the same to RTO authorities through a message sent through GSM.

**Index Terms**—LPC2148, Rule violation, GSM module

## I. INTRODUCTION

Traffic rules are made by the government to protect ourselves and other drivers on the road. But nowadays majority of the people are not following the traffic rules which results in the traffic accidents. The major traffic violations such as overspeeding, overhonking are not done intentionally. The main reasons may be due to the driver’s lack of concentration, inattention, lack of awareness which will directly effect the driving performance. So, it is difficult to manually alert the drivers about their traffic rule violation and therefore it is important to install a traffic violation management system for a vehicle. Here the important thing is to make this system automatic and more effective so that it will warn the driver to react to the situation. Various embedded systems have been developed in past few years and each system has its own advantages and disadvantages. These smart embedded systems

has to be designed in such a way that it has a ability to decide which task has to be performed based on the multiple complex inputs. The main objective of the proposed system is to detect the violation of the rules committed by the driver and alerting the driver about the violation through SMS. The system will also inform the RTO office by sending the rules violation and vehicle number plate by SMS.

## II. LITERATURE SURVEY

There are many different existing devices which are available in the market which are as follows:

1) Using RFID technology

The traffic rule violation is detected by means of sensors, a mobile application which holds the image captured by camera and RFID tags the information regarding the owner, fine related to the violation and it will send to the mobile phone of traffic police.

2)Automatic number plate recognition

The system use camera which will capture the number plate of the vehicle and uses some machine learning algorithms to recognize the vehicle from the image which further uses SMS module to notify the vehicle’s driver as well as RTO office about traffic rule violation.

3)Using Zigbee

In this system, the zigbee transmits the speed limit, sound limit for the particular lane entered by the driver. The receiver receives the message which is fixed in the vehicle and sends to the microcontroller which will display a message on the LCD. If the driver exceeds the limit then the microcontroller



sends the message to the traffic police using GSM module.

### 7 III. PROPOSED SYSTEM

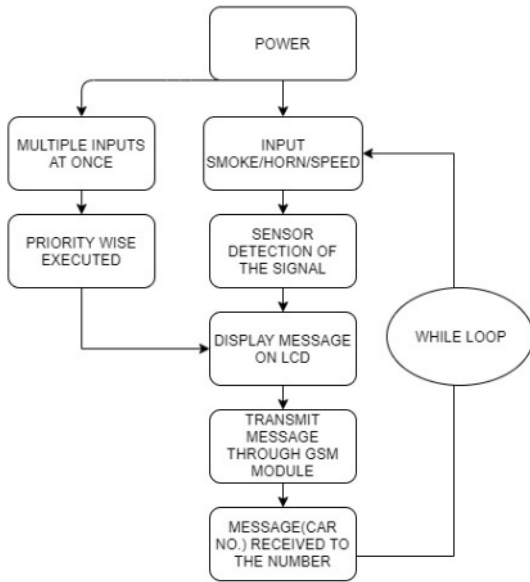


Fig. 1. Block Diagram of the proposed system

**Proposed System:** The components used in the system are sensors, microcontroller and GSM. The concepts used are reading the value from the sensor and analysing it accordingly and interfacing it with GSM. The proposed system have the advantage of being cheaper than the other modules which is already available. This system meets the need of automation. The sensors used in this module are sound sensor(Sound Detector(MH)), speed sensor(MH-Sensor series i.e. LM393), gas sensor(MQ Sensor). [4]The gas specifically checks the CO content released from the vehicle.

The hardware components used are:

- A. Sound Sensor
- B. Speed Sensor
- C. Gas Sensor
- D. LPC2148 micro controller
- E. GSM module
- F. LCD Display

#### A. Sound Sensor

This sensor basically detects whether the sound level exceeded certain threshold value. The detected sound is fed into an LM393 Op-Amp. The sound sensitivity is adjusted through an on board potentiometer. The led on module is illuminated when the detected sound level is above the threshold. This indicates that the output is low. This works with at most 5V.

#### B. Speed Sensor

The speed sensor consists of IR module along with the



Fig. 2. Sound sensor



Fig. 3. Speed sensor

LM393 comparator which is used to detect the speed at which motor is rotating. This sensor creates a digital pulse if something of maximum width of 5mm passes between the slot of the sensor. There is an led which turns off when if something passes through the sensor slot. This module will work at most for an input voltage of 5v and it has both analog as well as digital output.

#### C. Gas Sensor

The MQ7 gas sensor detects the presence of carbon monoxide



Fig. 4. CO sensor MQ7

gas in the air. [3]It detects the gas at lower temperature and the range is between 20 to 2000ppm. Most importantly the sensor module must be preheated for 15sec. This module will work at most for an input voltage of 5v and it has both analog as well as digital output. The sensitivity of the sensor can be adjusted with the help of potentiometer.

#### D. LPC2148 micro controller

LPC2148 is an ARM7 based microcontroller which is



Fig. 5. LPC2148



Fig. 7. 16x2 LCD

designed by Philips and can be configured as 16bit as well as 32 bit. The board has both on chip peripherals like lcd, led, switch, push buttons etc and also off chip peripherals like ADC, DAC, timer, PWM,RTC and so on. It has many serial interfaces like UART,I2C buses. The embedded c program should be written in KEIL4 software and the compiled code is dumped to microcontroller using flash magic application. The kit will work for input voltage of 3.3v and 5v and it has 32 GPIO's to which sensors can be connected. The microcontroller has 512K bytes of flash memory and 42K bytes RAM and has two power saving modes.

#### E. GSM module

In this system the GSM used is SIM900A.[1] GSM stands



Fig. 6. GSM Module SIM900A

for Global System for Mobiles. This modem requires a sim card for cellular network. SIM900A GSM/GPRS modem has a RS232 serial communication port. The modem supports many features like voice call, sms, data/fax, GPRS etc. This can support external power supply of 12V and can draw maximum of 2A. There are two on board led, in which one is to indicate power and the other is to indicate network. The network led at the start blinks for every 1 second and after the network registration it blinks after every 3 seconds. AT commands are used to operate the GSM module. This uses UART communication to communicate with the LPC microcontroller. This module is just like our mobile phone with unique phone number.

#### F. LCD Display

In this system the LCD used is 16\*2 LCD display. This can work in two different modes namely 4-bit and 8-bit mode. Here, 4-bit mode is used in which the data is sent nibble by nibble. A nibble is a group of 4 bits data. The 8 bit data is subdivide into a byte of lower and higher nibble. This helps in sending 8-bit data. The two modes of LCD is to read and

write. Usually writing data is simple rather than reading data. LCD commands are used to perform operations and send data to display on it.

Monitoring traffic rules can be done manually too. But in metro cities it is very difficult to monitor manually by traffic police due to heavy traffic. In such case, the automatic module monitors and warns the driver from avoiding it. This helps in reducing road accidents.

The module discussed in this paper are basically divided into two main modules:

1. Continuous reading data from the sensors and comparing with the threshold

This is a sensor based module in which three sensors are interfaced with the microcontroller. The method is to continuously monitor/sense the emission rate, sound level and speed. For this, the GPIO(General Purpose Input Output) of the LPC2148 microcontroller is used. This receives the data from the sensor and it is programmed to check it to a certain level. When it exceeds the limit a warning message is displayed on the LCD. The three job is arranged in events which helps to monitor it systematically.

2. Sending a warning message to the driver and higher authorities.

After the display on the module the message from the registered vehicle is sent to higher authorities(i.e. RTO head) and also to the owner of the vehicle. For this purpose, in this module GSM is being used. The GSM module helps to send and call the registered number. This reduces the job of checking it manually. The culprit is automatically spotted with this module. The communication between microcontroller and GSM is done by UART serial port.

## IV. IMPLEMENTATION

The below given figure shows the hardware implementation (design) of the traffic rules violation detector. It comprises of LPC2148 micro controller, gas sensors, speed sensor, sound detector and GSM module. If the sensor detects the gas/over speed/sound then it gets displayed on the LCD indicating that the vehicle is violating the rule and simultaneously it sends the message to the RTO office and to the respective person who is violating the rules. The figure shows the overall proposed system. It consists of two sections; one is

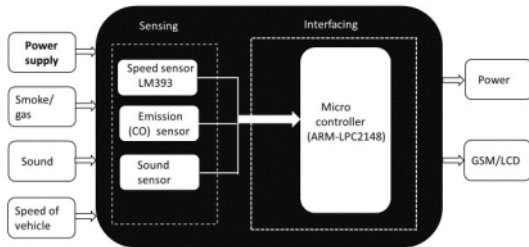


Fig. 8. Block Diagram for implementation

the vehicle section and the second one is the RTO section. In the vehicle section it consists of micro controller as it provides some of the features like low power utilisation and high performance. MCU is the brain of the embedded systems that control the action of each device or different devices. The sound detection sensor module detects whether the sound has exceeded the threshold value. The sound value set point is adjusted via an on-board potentiometer. When the sound level exceeds the set point, it gets displayed on LCD indicating that sound is detected. The figure displays 'YES' or 'NO' i.e. whether the sound is detected or not on LCD which is fixed in the vehicle. The LM393 module is used to



Fig. 9. "Sound Detected" displaying on LCD

determine speed of the rotating object and measures the speed of the motor. If the vehicle exceeds the maximum speed then the led which is present in the sensor turns off indicating that the speed has exceeded and it gets displayed on the LCD. The figure displays 'YES' or 'NO' i.e. whether the speed is detected or not on LCD which is fixed in the vehicle. The RTO section consist of the GSM module. Micro controller's RX (P0.1) is connected into GSM module's TX and Micro controller's TX (P0.0) is Connected into GSM module's RX pin. whenever the gas/sound/speed is displayed on the LPC of the microcontroller, this message is sent to the GSM module



Fig. 10. "Gas Not Detected" displaying on LCD

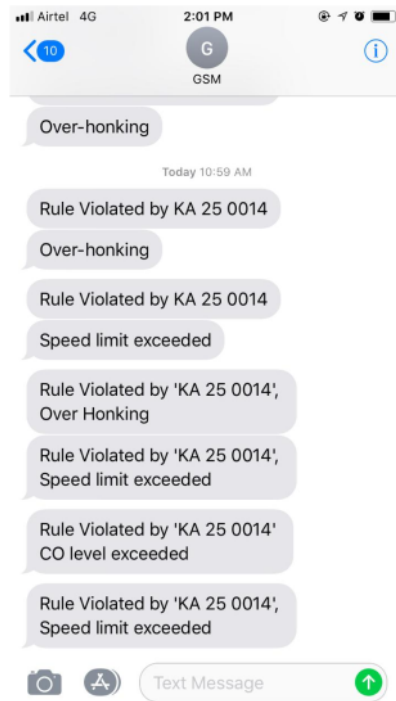


Fig. 11. Message received at target device

through the transmitter of microcontroller to the receiver of GSM from which the message is sent to the RTO office as well as to the person who is violating the rule. The figure displays the output of the GSM i.e. the messages which are sent to the RTO office and the person who is violating the rule

## V. CONCLUSION

In this paper, an embedded system of automatic traffic rule violation detection is realised and the prototype is built successfully wherein the the microcontoller is capable of

sensing any rule violation with help of sensors and alert the same to RTO authorities and the driver through GSM module, with good results, with further redesign and updating this prototype can be a robust system.

#### VI. FUTURE SCOPE

We have currently restricted to selected rules like over honking, over speed and exceeded range of carbon monoxide content released by the vehicle, but the prototype could be updated using other sensors which is responsible for other traffic rules like lane detection, stop line detection and parking on wrong spot to make it a complete system, which has the potential of detecting most of the major rule violations on road.

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