

# MISA LUMINOUS SPARK

## 2022-23

PROCEEDINGS OF SECOND INDIAN  
CONFERENCE ON INNOVATIVE &  
ADVANCED MULTIDISCIPLINARY  
RESEARCH



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### **EDUCATIONAL CREDENTIALS**

- Ph.D. in Life Sciences (Algal-Biochemistry) - University Department of Life Sciences, University of Mumbai.
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### **TECHNICAL PROFICIENCY**

- Special Skills: (Hematology, Neurobiology & Embryonic Stem cell Biology) Isolating and purifying hematopoietic stem cells from bone marrows of healthy and leukemic patients.
- Determining molecular markers using immune fluorescence microscopy, FACS and qRT-PCR to discern healthy hematopoietic stem cells from cancer stem cells so that they could be targeted specifically.

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- Immunization of mice and raising of monoclonal antibodies. Extraction and purification of proteins, biochemical assays and kinetic studies. Chromatography Techniques like DEAE, CM-Cellulose, Affinity chromatography, Gel Filtration, HPLC and TLC

Routine protein work like Native, SDS PAGE, Western blotting, Iso-electric focusing and 2 D PAGE gel electrophoresis.

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## **Speaker 2: Sharbani Kapoor**



- Graduate with Physics & Computer science Post graduate with computer science  
MBA, MA in Education, Joined as as faculty in ICAI, In 1987 Start Bombay  
Computer Centre of ICAI.
- Conduct sessions on Information Technology for Members and Students of ICAI  
1997 Launch & Implemented Campus placement for Newly qualified CA  
1999 Launch Information System Audit course, 2007 Conducted ICAI awards  
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### **Speaker 3: Sharbani Kapoor**



- Prof. (Dr.) Ajitkumar Gorakhanath Patil is the most distinguished scientist of Electronics and Biomedical Engineering in India who has made significant contribution in the field of Bioengineering through Research, Development, Education and Training for the last Four Decades.
- This has benefited hundreds of industries, hospitals, institutions and thousands of professionals; and made a great impact on the scenario of Health Care Delivery System in India. He was associated with S.B.M. Polytechnic, Mumbai since 1979 and worked as Head, Post-Diploma Department of Medical Electronics and Department of Electrical Engineering.
- Born on 19th March, 1958 in Satara district of Maharashtra State, Dr. Patil obtained DIE, Grad. IETE and MS degrees from Walchand College of Engineering, Sangli, IETE, New Delhi and Birla Institute of Technology and Science, Pilani respectively; and PhD in Instrumentation Engineering from SGGS Institute of Engineering and Technology, Nanded.
- He has extended support to National Cold Chain Resource Centre for the noble cause of “Child Health and Immunization” initiative of Government of India and UNICEF and providing expert assistance to various states, SARC and Indo-Pacific countries.
- He is recipient of numerous awards and honors. Few of them are: National Award for Outstanding Work, from the President of India (1989); NRDC National Invention Award for Meritorious Invention (1994); UP Government-ISTE National Award for Innovative Research and Development Work (1995);

Government of Maharashtra - State Teacher Award for Outstanding Contribution in Engineering Education and Social Work (1999); IETE-RSK Gold Medal in Recognition of Distinguished Contribution in the field of Medical Electronics through Research, Development, Education and Training for the last Three Decades (2010), Vijay-Ratna Award for Enriching Human Life and Outstanding Attainments (1997), National Award under the Ministry of Social Justice and Empowerment as a Role Model from the President of India (2013)

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**Dr. Kavita Aggarwal**



**‘Educators have three loves: love of learning, love of learners, and the love of bringing the first two loves together.’**

With a career spanning over four decades in the field of education, I feel honored to have had such a rich, diverse and significant experience in the various dimensions of teaching and contribute effectively towards building a brighter future generation.

Doctorate in Education Management and a rich experience of 40 years in the Education Industry as a leader and an educator has allowed me to share my expertise and knowledge at the national and international educational platform. Since then the face of education has changed significantly and it feels great to be a part of driving this positive change!

I have been the Principal of leading National and International schools and have set up systems, policies, and procedures; procured affiliations, trained and mentored teachers including Vice-Principals / Principals and administrative staff.

My expertise lies in setting up new schools affiliated with Cambridge International Examinations (CAIE), Cambridge, UK, and CISCE curricula owing to which I have consulted on various projects for new schools right from inception to complete functioning.

I am also heading as Chairperson of ‘**Members of International Schools Association**’ (MISA), a prestigious organization of 110 Cambridge schools in the country affiliated to CAIE.

**MISA ( Members of International Schools Association )** was initiated by me in 2007 with few like-minded people to empower teachers and help schools to overcome the academic & administrative hurdles of the Cambridge curriculum. The main objective of MISA is to empower the teachers and school leaders in managing the international curriculum.



Currently, I am associated as Director/Head of School with D. G. Khetan International School, Malad West. Being the Founder Principal of this school right from its inception in 2006 affiliated with Cambridge International U.K.

I have attended various conferences as a Speaker and Moderator at National and International platforms. My views and opinions with regards to the education sector have been published in various newspapers and magazines. I'm also humbled to be a recipient of many awards for my outstanding efforts and contribution to the field of education.

I have always believed that the all-around development of the students means their development in **IQ, SQ, EQ & AQ** along with their physical development I truly believe that if our words and actions inspire our students to dream more, learn more, do more, and become more, then we are on the path to creating responsible future leaders.

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## Conference Chair

### Professor Chaudhary Vivek:

I , Professor Chaudhary Vivek Heads the Department of Research & Development Cell and Mathematics Department at B.K Gadia A Level Junior College, As a PhD Scholar at IIT Bombay and ISRO, I am actively involved in various Satellite projects under the Department of Space Ministry for Government of India. I was involved in the Chandrayaan and Gaganyaan Project, and have actively been a part of various Space missions across the globe too which includes my visit to USA and Japan. I have also been appointment by the government of India for the NEP Committee member responsible for handling syllabus Co-ordination etc. I have published around 25 research papers; this publication includes papers from both Indian and International conferences few of them include IEEE and springer. My Active Area of research is Microstrip Broadband Antennas and I have fabricated around 15 MSA's, for which I was been awarded by University of Mumbai. I have also been active in the field of education for past 10 years wherein my role includes setting up Stem lab, training International School teachers for Math and Research.

I took this Initiative of conducting the **First International Research paper conference 2021**, MISA LUMNIOUS SPARK which was an event for Research paper conference for International School Learners across India. I was responsible for conducting the entire conference which included the following role as Conference Chair, National Advisory Committee and also as Publication Chair , this was the first time when such an event was conducted for school learners in order to enhance their research skills.

## **Mrs. Kovita Gupta**

I, Mrs. Kovita Gupta, A Level Coordinator, School Counsellor & HOD (Chemistry) at B.K. Gadia 'A Level' Junior College, felt immense pleasure in planning, structuring and executing the second Indian Conference for International students, MISA Luminous Spark. The three- day conference themed 'Innovative & Advanced Multidisciplinary Research' was a huge success with greater participation of learners than the previous event. I started off my career as a Chemistry faculty for grades 11 & 12 in a CBSE residential school in NCR, Delhi. Thereafter, I got an opportunity to work with Council of Scientific & Industrial Research- Institute of Himalayan Bioresource Technology (CSIR-IHBT) as a Research Scholar. During my research in the 'Identification & Characterization of Biomolecules in medicinal plants', intriguing findings and exploration gave way to develop an analytical & critical mindset in me. That is when I realise this thought process must be developed in the young minds at the right time. After moving to Mumbai, I pursued my career in teaching as a Chemistry faculty in various institutions affiliated to CBSE as well as Cambridge Curriculum. Having been able to impart knowledge with the approach of inquiry-based learning over the years, this journey has turned out to be a continuous learning process along with the teaching process. Through MISA Luminous Spark, I could use my expertise in research methods by guiding the participants at key stages of their research work. I wish to give my best for the welfare of student community, the future Human Resource of our nation.

## Contents

### Teachers:

1. MENTAL FITNESS: IMPORTANCE OF FREQUENT COUNSELING FOR TEENAGERS [1]  
{Ms. Foram Kothari : DG Khetan International School}
2. ARTIFICIAL INTELLIGENCE IN ENGLISH LANGUAGE TEACHING THROUGH ONLINE TOOL- W&I [7]  
{Soma Sinha Vibgyor : High School Airoli}
3. ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON VALUE CREATION ..... 14]  
{Ms. Rakhi Vivek Kansara : DG Khetan International School}.
4. HOW SHIFT IN THE ROLE OF TEACHERS IN THE TEACHING LEARNING PROCESS IMPACTED LEARNERS DURING THE COVID-19 PANDEMIC? [18]  
{Silika Shetty : DG Khetan International School}

### Learners:

1. Career security of Indian sportsperson (global champions)..... [25]  
{Cholina Shah: DG Khetan International School}
2. Military Communication: Its Role In The Defense Of a Country ..... [30]  
{Nikhil Sinha: Trinity International School}
3. DIGITAL MARKETING- SMALL SCALE BUSINESSES VS LARGE SCALE BUSINESSES IN FOOD AND HEALTH..... [33]  
{Nishita Vaswani : Euro School Airoli}
4. MILITARY COMMUNICATION: THE REQUISITE OF THE PROGRESSIVE ERA..... [36]  
{Priyansh A. Shah : Utpal Shanghvi Global School }
5. EVOLVING HEALTHCARE SYSTEMS THROUGH DIGITALIZATION ..... [39]  
{Shllok Tahiliani : Trinity International School }
6. CAREER SECURITY FOR INDIAN SPORTSPERSONS ..... [44]  
{Aahaan Angirish : Jamnabai Narsee International School}
7. TOPOLOGICAL CONFIGURATIONS AND OPTIMIZATION TO STRENGTHEN UNDERWATER NETWORKS..... [48]  
{Aatmi Dharmesh Parekh : Utpal Shanghvi Global School}

8. WAVE OF ADVANCEMENT CAUSED DUE TO TECHNOLOGY. ..... { V. Akshaya K. Velayutham: Trinity International School, Mumbai }	[52]
9. IMPACT OF LEADERSHIP ON BUSINESS MANAGEMENT..... { Aman Ojha Trinity: International School }	[56]
10. COMPUTATION IMAGING IN CELL BIOLOGY..... { Avani kokate : Ram Ratna International School }	[61]
11. IMPACT OF LEADERSHIP IN BUSINESSES ..... { Ayaan Gwalani : Jamnabai Narsee International School }	[67]
12. ROLE OF DIGITAL MARKETING IN INDUSTRIES { Shristi Sharma Trinity International School }	[70]
13. UNDERWATER WIRELESS SENSOR NETWORKS FOR DISASTER MANAGEMENT { Chaitanya A Padhye Trinity International School }	[75]
14. A LITERARY REVIEW ON COMPUTATIONAL SYSTEMS, MODELING AND SIMULATION AND THEIR CONTRIBUTIONS TO MEDICINE { Daksh Malhotra Utpal Shanghvi Global School }	[79]
15. CONTRIBUTION OF COMPUTATIONAL SYSTEMS, MODELING AND SIMULATION IN MEDICAL ADVANCEMENT { Devika Gaurav Pathak Jamnabai Narsee International School }	[83]
16. IT TRANSFORMS THE MEDICINAL WORLD { Hridhdhima Mehta Utpal Shanghvi Global School }	[87]
17. DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES { Kriti Khanna Jamnabai Narsee International School }	[92]
18. WHAT IS MILITARY COMMUNICATION AND HOW DOES IT EMPOWER THE DEFENCE SYSTEM OF A COUNTRY? { Misha Sirnani Podar International School }	[96]
19. COMPUTATIONAL MODELLING AND SIMULATION IN HEALTHCARE: A SUMMARY { Pari B. Yadav Omkar Cambridge International School }	[99]
20. THE IMPORTANCE OF COMPUTATION, MODELING AND SIMULATION INMEDICAL { Preksha Jain Savitridevi Hariram Agarwal International School }	[103]
21. A REVIEW OF CONTRIBUTION MADE BY COMPUTATIONAL SYSTEMS, MODELLING AND SIMULATION IN MEDICAL ADVANCEMENT { Russel P. Gandhi Utpal Shanghvi Global School }	[109]

22. THE FUTURE OF DIGITAL MARKETING AND ITS EFFECTS ON THE SUCCESS OF SMALL BUSINESSES [114]  
 { Agastya Guha Ram Ratna International School }
23. IMPACT OF LEADERSHIP STYLES ON CREATING A HIGHQUALITY WORK CULTURE [120]  
 { Arya Sherekar Bombay Cambridge International School (East)}
24. IMPACT OF INTRODUCING MORE RELIABLE WEARABLE SENSORS IN HEALTH CARE MONITORING [124]  
 { Aryak Malhotra Billabong High International School, Malad (IN677) }
25. LEADERSHIP- THE CORE OF A BUSINESS [132]  
 { Devanshi.S.Jatania Savitridevi Hariram Agarwal International School. }
26. COMPUTATIONAL MEDICINE – MOVING FROM UNCERTAINTY TO PRECISION [135]  
 { Drisana Chauhan Ram Ratna International School }
27. 27.MODELING AND SIMULATION IN MEDICINE: ETHICAL TRADE-OFF BETWEEN EFFICIENCY AND CARE FOR ALL [140]  
 { Haiet Ashar Bharati Vidyapeeth Rabindranath Tagore School of Excellence }
28. METHODS ABOUT HOW ACARS MINIMIZED OVERSIGHT WHILST ARIEL [144]  
 { Ronil Chokshi Billabong High International School }
29. IMPROVISED HIGH FREQUENCY TECHNOLOGIES IN MILITARY COMMUNICATION [148]  
 { Sparsh Choudhary Ram Ratna International School}
30. IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT [153]  
 { Yatee Shirke Sanjay Ghodawat International School}
31. WIRELESS TECHNOLOGY: IT’S ROLE IN MILITARY COMMUNICATION TO EMPOWER DEFENSE OF A COUNTRY [156]  
 { Aaryan Dambe Ram Ratna International School }
32. EFFICACY OF FORENSIC ACCOUNTING IN CURBING CORRUPTION AND FINANCIAL FRAUD: A SCRUTINY OF CASE STUDIES FROM ASIA AND AFRICA [166]  
 { Alexia J. D’souza Billabong High International School Malad }
33. THE EVOLUTION OF MODERN MARKETING AND ITS EFFECT ON COMPETITIVENESS [173]  
 { Siddhant Vaidya Crimson Anisha Global School}
34. IMPROVISATION IN UNDERWATER COMMUNICATION FOR DISASTER MANAGEMENT [177]  
 { Anay Joglekar (IGCSE) Sanjay Ghodawat International School}



35. IMPACTFUL BUSINESS LEADERSHIP: PERSEVERANT HUMILITY OF AN ACROBATIC MIND [182]  
 { Anay Gupta Ajmera Global School }
36. EMPLOYING COMPUTATIONAL SYSTEMS AND NETWORKS IN PREDICTION AND MODIFICATION OF DISEASE GENES TO INCREASE IMMUNITY [187]  
 { Ekambir Singh Ajmera Global School }
37. COMPUTATIONAL MODELLING IN PRECISION MEDICINE- DIGITAL TWINS ..... [192]  
 {Girija A. Abhyankar Children’s Academy Thakur Complex }
38. USING DRONES AS AN ALTERNATIVE TO PRESET TRAFFIC SYSTEMS AND SURVEILLANCE CAMERAS [196]  
 { Anushree Kagalkar Prabhavati Padamshi Soni International Junior College }
39. FORENSIC ACCOUNTING- AN EXCELLENT DETERRENT TOWARDS FINANCIAL FRAUD [200]  
 { Priyam Poddar Pinnacle High International School }
40. ANALYSIS OF WEARABLE SENSOR SYSTEM RELIABILITY IN THE MONITORING OF EPILEPTIC SEIZURES [203]  
 { Anjali Mehta Prabhavati Padmashi Soni International Junior College }
41. CRUISE CONTROL AND ACCIDENT PREVENTION [207]  
 { Annika Davuluri Prabhavati Padamshi Soni International Junior College }
42. DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES [211]  
 { Ahaan Kedia Jamnabai Narsee International School }
43. DIGITAL MARKETING - AN AID TO BUSINESS’ ADVANCEMENT [220]  
 { Kanak Bhawmik Bombay Cambridge International School, Andheri (E) }
44. IMPROVISATION IN UNDERWATER COMMUNICATION FOR DISASTER MANAGEMENT [224]  
 {Harsh Tejas Shah Sanjay Ghodawat International School }
45. HOW DEPENDENT SHOULD ONE BE ON WEARABLE SENSORS FOR MONITORING OF THEIR HEALTHCARE [227]  
 {Jai Mishra Billabong High International School }
46. IMPLICATIONS OF EFFECTIVE LEADERSHIP TO ELEVATE ORGANIZATIONAL PERFORMANCE [231]  
 {Jay Siddharth Shah Utpal Shanghvi Global School }
47. RELIABILITY OF WEARABLE SENSORS IN HEALTH CARE MONITORING.. [237]  
 {Mannan Malik Prabhavati Padamshee International Junior College }

48. PRECISE SURGICAL TREATMENTS ENSURED WITH DIGITAL TWIN MODELS {Mauli Shah Ajmera Global School}	[240]
49. IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT {Natasha Datar Sanjay Ghodawat International School, Atigre, Maharashtra.}	[242]
50. INTERPRETING TRANSFORMATIONAL LEADERSHIP AND ITS IMPACT ON ORGANIZATIONAL PERFORMANCE {Nishtha Lakhani Euro school Airoli}	[247]
51. UNDERWATER: ONE WAY TO BOAST THE BREAKTHROUGH {Sachee Galankar Podar International School CAIE}	[250]
52. COMMUNICATION IN THE ARMY {Shaivi Mhaiskar Euro School, Airoli}	[254]
53. THE NEXT GEN OF MARKETING {Shubham. P. Jatania S.H. Agarwal International School}	[258]
54. DIGITAL MARKETING AND ITS ROLE IN THE BUSINESS SUCCESS OF SMALL AND LARGE ENTERPRISES - A PERSPECTIVE {Siddhant Ray Grade 10 Jamnabai Narsee International School }	[262]
55. DIGITAL MARKETING: ANYTIME, ANYWHERE {Ms. Swara Gajanan Tendulkar Euro School, Airoli}	[272]
56. TRENDS ASSOCIATED WITH STRENGTH OF KNOWLEDGE ECONOMY CORRELATING TO GROWTH {Ujjwal Sharma Billabong High International School, Malad (IN677)}	[276]
57. ROLE OF MILITARY COMMUNICATION IN EMPOWERING DEFENSE {Viren Oswal Sanjay Ghodawat International School}	[283]
58. WEARABLE SENSORS IN HEALTHCARE: RELIABLE ENOUGH? {Hridikk Hingorani Prabhavati Padamshi Soni International Junior College }	[283]
59. RELIABILITY OF WEARABLE SENSORS IN HEALTH CARE MONITORING {Bhumi Shah Prabhavati Padamshi Soni International Junior College( PPSIJC) }	[291]
60. DESIGNING AN AIRBORNE VEHICLE COMMUNICATION SYSTEM FOR TRAFFIC SURVEILLANCE- AN OVERVIEW { Madhav Kabre Crimson Anisha Global school}	[300]
61. FORENSIC ACCOUNTING AND ITS USEFULNESS TO PREVENT AND UNEARTH GLOBAL CORRUPTION { Geetarath Rajiv Arora Sanjay Ghodawat International School }	[302]
62. AGRARIAN VS KNOWLEDGE: THE FUTURE OF THE WORLD ECONOMY.... {Maahi Patel , Prabhavati Padamshi Soni International Junior College}	[307]

63. WEARABLE SENSORS IN HEALTH CARE MONITORING: HOW EFFICIENT ARE THEY AND WHAT IS THEIR SCOPE? [311]  
{Naina Menon Crimson Anisha Global School}
64. THE RELIABILITY OF WEARABLE SENSORS IN HEALTHCARE MONITORING [314]  
{ Riona Shashank Merchant PPSJIC }
65. QUANTITATIVELY EVALUATING THE RELIABILITY OF WEARABLE SENSORS IN DIAGNOSIS, TREATMENT AND RECOVERY FROM COVID-19 [317]  
{Samkeet Shah Prabhavati Padamshi Soni International Junior College}
66. HOW GLOBALIZATION AND THE NEED FOR INCREASE IN WORLD EFFICIENCY REQUIRE BOTH KNOWLEDGE AND AGRARIAN ECONOMIES [322]  
{Vedant R Iyer Pinnacle High International School}
67. IMPACT OF LEADERSHIP ON ORGANIZATIONAL PERFORMANCE [326]  
{Piaa Santani Jamnabai Narsee International School}
68. PERSONALIZED MEDICINE WITH TECHNOLOGY [330]  
{Satej Shinde Sanjay Ghodawat International School}
69. EMPIRICAL ANALYSIS OF LEADERSHIP SHAPING THE FUTURE VENTURES OF A BUSINESS MANAGEMENT (IMPACT OF LEADERSHIP ON BUSINESS MANAGEMENT) [333]  
{Riddhi Jais Ajmera Global School}
70. IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT [338]  
{ Poorva Bharatesh Ketkale Sanjay Ghodawat International School }
71. DIGITAL MARKETING: THE GAME CHANGER FOR SMALL SCALE INDUSTRIES (SSI) [342]  
{ Palaash Jadav Children’s Academy, Thakur Complex }
72. SMALL SCALE INDUSTRIES-A GATEWAY TO OPPORTUNITIES [346]  
{ Dhriish Makhija Trinity International School }
73. DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES [348]  
{ Siddhant Kuge, Sanjay Ghodawat International School, Atigre, Maharashtra }
74. CONTRIBUTION OF COMPUTATIONAL SYSTEMS, MODELLING AND SIMULATION IN CARDIOVASCULAR DISEASES [351]  
{ Anshuja More Euro School, Airoli }
75. ROLE OF MILITARY COMMUNICATION IN EMPOWERING DEFENSE SYSTEM OF A COUNTRY [355]  
{ Evan Gupta Euro school, Airoli }

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### MENTAL FITNESS: IMPORTANCE OF FREQUENT COUNSELING FOR TEENAGERS

**Ms. Foram Kothari**

DG Khetan International School

#### Abstract

Teenage is the age between 13 and 19 whereas adolescence is the age between 10 and 19 years (WHO). Adolescents experience changes in body and behaviour in this age. Such confused children are in constant need for counsel. However, it comes as a surprise to parents as they are not well-equipped to handle these changes in their children. Mental health needs of teenagers is neglected by most of the parents. In this paper, we have discussed the importance of counseling for teenagers that will be helpful in identifying their problems at an early stage and to resolve them. 57 interviewees took the survey to furnish data regarding their counseling needs. The key findings and suggestions of the survey will be discussed in the presentation.

**Keywords:** *counseling, adolescents, psychoeducation, stigma, teenage*

#### INTRODUCTION

Mental health is a state of being in which a person manages his relationships as well as deals with stress in a productive way without comprising on health and functioning [1].

In contemporary age, the importance of mental fitness is rampantly verbalised in all age groups specially the adolescents. A number of literature works articulate the vitality of mental fitness in relation to educational achievements and efficiency, managing social life and performance at workplace [1]. Studies have linked poor mental health with poor grade points, lower graduation rates and weaker retention in academics [1].

In order to help students develop skills needed for psychological elasticity to influence their mental health, counseling and psychology education becomes an integral part of school life. The current age adolescents are vastly different from previous generations especially in their way of addressing mental health with their attitudes, beliefs and value systems [1]. A healthy state of body is linked with physical, mental, social and emotional well-being. The attitudes and beliefs of this generation are profoundly different from the past. In fact, this age group is considered to be at high risk because most mental health issues are triggered in adolescence or adulthood. World Health Organisation (WHO) defines adolescence as the age in life between 10-19 years. This is a transient period of life moving from dependent childhood to self-reliant adulthood. This age is combined with rapid changes in physical appearance along with biological changes. They experience a series of changes causing psychological maturation turning adult like in behaviour [2]. It is also an age of contradictions, when all things seem unclearly defined, when values and beliefs undergo major changes, when all ideals and inspirations are severely analysed. This is



also an age where peer groups form an important part of the adolescents' environment. When faced with a problem, if an adolescent is not helped by the school, family or teachers, it is probable that they turn to peer groups for decision making, which may not be realistic. They enjoy being a part of a social group as they can interact with the external world and create opportunities for growth [5].

Adolescence is characterised by changes in all dimensions (physical, cognitive and behavioural), increasing expectations from parents and society, an age of uncertainties, new roles and responsibilities. They start devising their own theories and tend to be idealistic, which taking ownership of making decisions. This phase is also marked by enhancing sexuality when they become emotionally sensitive and are attracted to other people. They reduce their communication with their parents and come closer to their friends. They experience mood swings and confusion regarding their identity. It is a phase full of highs and lows marked by confusions regarding one's physical, emotional, social self and career. All these changes pose a number of challenges to them. The constant pressure to perform academically, to meet societal expectations, parents and teachers' demands. They are faced with challenges of coping with attendance, pressure of examinations, to prepare for studies abroad, to prepare for being self-reliant, to remain cool and resilient in face of adverse circumstances [5].

While some students have better coping strategies, some are unable to be resilient in the face of adversities. It leads to confusion, stress, frustration and insecurities. They become disillusioned, overwhelmed and are unable to cope. They try to reduce stress by turning towards alcohol or drug and as at a risk of developing substance abuse. In order to refrain them from falling prey to such negative strategies, counseling and psychoeducation becomes an integral part of the services provided by schools and colleges for the well-being of the students [2]

### OBJECTIVES

1. To review various literature entailing the importance for counseling of teenagers.
2. To measure the level of counseling need among students.
3. To give suitable suggestions for improving mental health of adolescents.

### LITERATURE REVIEW - Importance of Counseling for Teenagers

Self-harm is one of the top most causes of adolescents' death in India causing around 60,000 deaths annually in the age group of 15-24 years, a latest global study shows [6]. It becomes increasingly urgent for a country to address this issue at ground level and deal with its causes.

Professional help in the form of counseling has been available but put to limited use as young people generally prefer to seek help from their peers, causing them to stay away from professional help and seek adult counseling. Such unprofessional help in times of unexplained behaviour can cause them to make inappropriate decisions. At times, it resolves the issue superficially and does not go to the roots of the problem. However, counseling is defined as an interactive process where the counsellor is trained to give assistance to the counselee. It is a process used to help clients with their interpersonal and personal conflicts by a therapist. The aim is to bring about a voluntary change in the client by use of various counseling techniques [2].

However, counseling teenagers can be a difficult task as they show a great deal of resistance that becomes a barrier in their therapy [3]. In order to resolve this, a counsellor should be better equipped with creative techniques for expression that are therapeutic rather than stigmatising.



There are ongoing changes in an adolescents' physical and biological self. Moreover, the pressure put by the society, family and school can be overwhelming. Thus, teenage years can be difficult and confusing times of one's life. Due to this, they require to strike a balance between freedom and independence and reliance on counseling [Veach & Gladding,2007,3]

Counseling is essential to assist the adolescents in understanding their self and the changes happening around them. A counsellor must not advice, recommend or give philosophical talk. One must facilitate the teenagers in self-discovery by using creative techniques.

Counseling is significant to facilitate verbal and nonverbal expression of thoughts, feelings and emotions in young clients thereby helping them structure their thoughts and channelising them.

Adolescents have limited experience and lack of proper self-respect criteria. They need guidance to form their ideal life, polish their moral judgements and raise their level of conduct and conscience. Thus, school counseling becomes a fundamental instrument of modern society. It assists teens in forming a balance, enhances student-teacher relationship, creates a safe place for students to communicate [4].

Adolescents live in an age of rapid social changes and expectations. Traditional family values are declining, lifestyles have become lonely, there is a pressure of keeping up with social media trends, there is separation from parents for pursuit of dreams, all compounding to the stress of students. Owing to all these changes, it becomes important to provide counseling support to students on campus [1].

### EXPERIMENTAL

A descriptive research design (a questionnaire) was used to systematically understand importance of counseling as perceived by teenagers. The universe of the study comprises of 57 respondents in the age group of 14 to 24 years, selected through simple random sampling.

### RESULT

**Table 1** Counseling awareness of the respondents

Sr. No.	Counseling awareness	Number	Percentage
1.	Awareness of benefits of counseling		
	Yes	49	86
	No	8	14
2.	Experienced unexplained behavioural changes		
	Yes	39	68.4
	No	18	31.6
3.	Sought counseling for such changes		
	Yes	16	28.1
	No	41	71.9
4.	Share problem with		



	Parent	20	35.1
	Friend	25	43.9
	Teacher	1	1.8
	Siblings	9	15.8
	Others	2	3.5
5.	Sharing problem helps you attain		
	Relief	32	56.1
	Solution	16	28.1
	Joy	1	1.8
	Acceptance	8	14
6.	Fearful of mental health stigma		
	Yes	10	17.5
	No	47	82.5
7.	Mental fitness as important as physical fitness		
	Yes	54	94.7
	No	3	5.3

**Table 2** Perceived Counseling needs of the respondents

Sr. No.	Counseling needs of students	Number	Percentage
1.	School/college provides counseling		
	Yes	17	29.8
	No	40	70.2
2.	Should schools/colleges provide counseling		
	Yes	53	93
	No	4	7
3.	Counseling needs of the respondents		
	1	11	19.3
	2	3	5.3
	3	20	35.1
	4	11	19.3
	5	12	21.1

### DISCUSSION

Table 1 shows that majority of the teenagers (86%) are aware about the benefits of counseling. 68.4% respondents experienced unexplained behavioral changes. However, only 28.1% respondents, i.e., 16 of them sought counseling for such changes. A huge number of respondents (43.9%) shared their problems with their friends, first. 56.1% of the respondents attained relief after sharing their problems and 28.1% attained a solution by sharing their problems. These solutions are from unprofessional sources and may not be appropriate to deal with the unexplained changes. A good thing to note is that 82.5% of the respondents are openly receptive about mental health fitness and not fearful of any stigmatization. 94.7% of the responses show that mental fitness is as important as physical fitness.

Table 2 explains the counseling needs of the respondents where 70.2% of the respondents say that their schools/colleges do not provide counseling. 93% of the respondents' demand that the





schools/colleges provide counseling to its students. 40.4% respondents fall under the category of high needs for counseling. Due to lack of counseling from educational institutes, there is a high chance that the students with high needs of counseling may go astray in absence of professional guidance.

### SUGGESTIONS

Counseling plays a vital role for teenagers whilst they experience imbalance and uncertainty. Guidance in the form of counseling can help teenagers develop coping mechanisms and be flexible to change. Most of the teenagers now identify mental health as an important factor of their overall health. However, the study undertaken shows that only 28.1 % adolescents sought counseling in face of unexplained behaviour. These adolescents can be provided with therapy and counseling sessions at school/college. 'Breathing room', 'Talk meter', 'Music therapy', 'Social media models', 'The Paper bag exercise' [3] and '4-M Model' [1] (addressing the holistic health of the counselee) are techniques that can be used at school/colleges to calm them down in face of anxiety, uneasiness or unexplained behaviour. We need to promote the culture of being outspoken about mental health at schools and colleges so that teenagers do not hesitate sharing their problems.

### CONCLUSION

Adolescence is an age with severe changes in the mind, body and behaviour of the people. Although it is a healthy period, there are various factors that put them at risk of adult diseases. These can be prevented by early intervention during this period. Teenagers are generally stuck between wanting freedom and still in need of guidance and counsel. In such a case, parents play an important role in guiding their children. However, there are many cultural barriers that restrict parental communication about adult talks of physical and physiological change [5]. Counseling teenagers is important as it helps them make better decisions about crucial issues of life [2]. The need is to educate parents and teachers to develop good relationship with children to ensure a safe environment for them. Educational institutions should equip themselves in order to guide, counsel, train and mould students' personalities to choose the right vocation and decision according to their capabilities and interest.

### ACKNOWLEDGEMENTS

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### ARTIFICIAL INTELLIGENCE IN ENGLISH LANGUAGE TEACHING THROUGH ONLINE TOOL- W&I

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#### Abstract

The evolution of knowledge acquisition has aimed at ability to provide stimulation to human intelligence. This paper concerns with reviewing the use of AI in language teaching and learning. Specifically, through content analysis, selected bibliometrics, and practical implementation of automated writing evaluation (AWE) tool – ‘Write & improve’ into language learning at the high school level. At first, the author studied various works of AI in the realm of education with special attention being paid to AWE as a cutting edge software which uses AI to assess students’ writing. The data collected reflects that AI algorithms used in different teaching websites help students manage their work and encourage them to write and revise. Within the framework of the article’s written task, high school students, who study English as their core subject at VIBGYOR High, Airoli, have been chosen. The study and experiment proved ‘Write & Improve’ to be highly effective among language learners, thus is an excellent tool for language learning.

**Keywords:** AI- Artificial Intelligence, AWE- Automated Writing Evaluation, W&I- Write and Improve.

#### INTRODUCTION

##### Theory

According to Oxford encyclopedia, Artificial Intelligence is the ability of a digital computer or computer controlled robots to perform intelligent tasks associated with human. Such machines are capable of conducting thought processes and respond like human beings. AI is now prolifically used in education sector.

1950’s is considered the birth of period of AI, Turing tried to define, when a system designed by humans could be called intelligent. In 1956, John Mc Carthy proposed that the study of AI be based on the fact that learning can be so accurately explained that a machine can be made to stimulate it.

Applying AI to language learning

Learning a new language is difficult yet rewarding. The perks involved are- new acquaintances, business opportunities, travel and access to tons of information. But can you really understand the peculiarity of a language without talking to locals? AI thinks you can!

AI can create group in students who are suited for particular tasks. This is known as adaptive group formation. AI application software can instantly grade students’ essays, these are then



added in the central database and the future essays can be compared using the previous essays present in the database. Artificial Intelligence in education is a computer based technology that provides personalised adaptive and insightful teaching. The key part of AIED system is domain knowledge model that provides the capability of the system to complete the tasks that make the students to judge to contribute to the solution. The student model that provides representation of the learner in terms of their developing knowledge and skills. The Model of pedagogy is the component that represents teaching capability of the system and finally the Interface component that provides the channel through which the learner and the system communicate. (Jayadesh Kengam, Bournemouth University)

Various tools have been invented for language learning: **Chatbots**-this AI powered Chatbots provides customized answers in response to your messages and can grade your performances or give tips on what you need to improve.

AI has aided **machine translation** to take a giant leap forward along with the improved quality of translation, neural machine translation into foreign language learning. Machine translation as a Bad Model is a pedagogical method whereby learners identify inconsistencies and errors in machine translated texts and correct them. This helps students understand a language and its peculiarities better and improve comprehension, sentence composition, vocabulary in the target language.

**Personalised textbooks** are great aids for learners to proceed at their own speed and understandings. When a language learning solution knows your progress and adapts to needs based on your personal data it can provide you with learning materials you need. Textbook customization can also be of value to teachers. If teachers can upload their educational programs into an artificial intelligence system, the system could generate textbooks customised for a specific school, course or even group of students.

### **Experimental Research method**

Analysis and synthesis to reveal the effectiveness of AWE tool 'Write & Improve'. This study critically examined researched publications on AI in education. Selected texts were identified and fully analyzed. Following criteria was followed strictly in the screening and selection process.:

- i) Research ought to be related to academic scenario, hence published research in commercial market, health care system and non-educational system were thus excluded.
- ii) Research must be data supported empirical studies; article solely based on personal experience was excluded.
- iii) Theoretical, conceptual and literature review papers were also excluded from full analysis but they were carefully read to strengthen background knowledge and broaden the theoretical foundation for developing a general understanding of AI in education.

The experimental part presents the findings of 'Write & Improve' AI language tool, at VIBGYOR High, Airoli. We had our secondary Cambridge students, who study First Language English as their main course for IGCSE. Students with different English proficiency levels were selected B1 (pre-intermediate) to B2 (upper intermediate). According to CEFR language proficiency level are:

A1 (Beginners)



- A2(Elementary)
- B1(Pre- Intermediate)
- B1+(Intermediate)
- B2(Upper Intermediate)
- C1(Advance)
- C2(Proficient User)

Firstly, students complete various written tasks using 'Write & Improve' online. Secondly, students received corrected feedback for their complete assignment. Finally, the research hers drew conclusion from the results.

For the study AWE 'Write & Improve' tool was used which is a free online tool developed by Cambridge Assessment English ([URL:https://writeandimprove.com/](https://writeandimprove.com/))

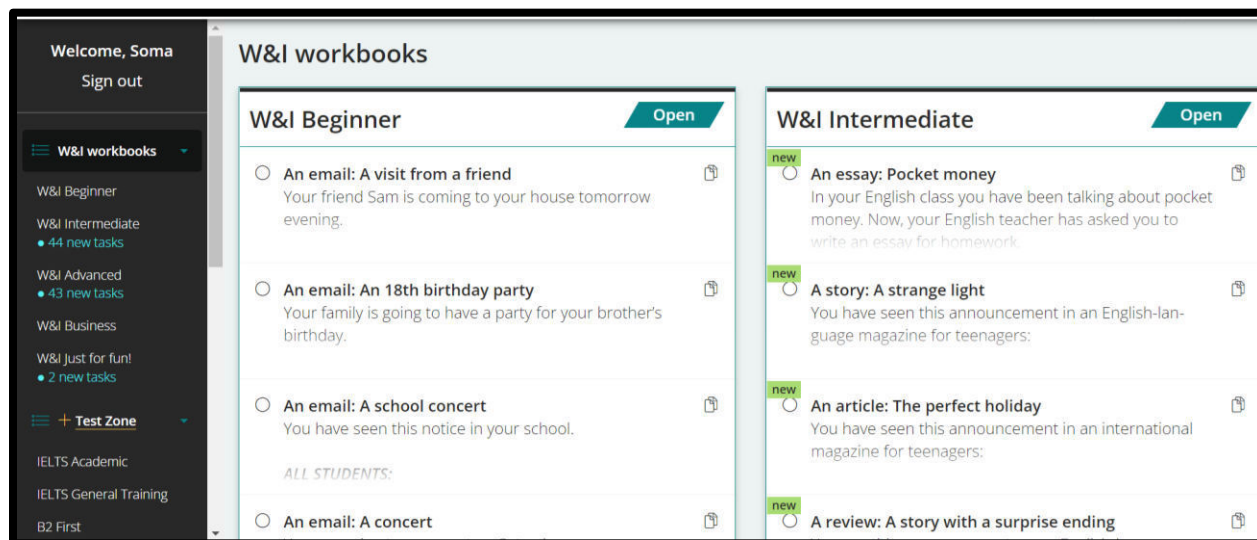
### Overview of 'Write and Improve'

AI has penetrated in every aspect of education, recently researchers have broadened its horizon from STEM subjects to languages and Arts. 'Write & Improve' is an AI driven online tool, developed by Cambridge Assessment English Project at the University of Cambridge to encourage students to write by assessing their scripts and providing immediate feedback based on Common European Framework of Reference (CEFR). The component of the software is tabled below.

**Table 1: Component of 'Write & Improve'**

Name of the tool	Designer of the tool	Criteria for feedback
Write & Improve	Cambridge University Cambridge Assessment of English	Content Communicative Achievement Organization Language

The focus of the study was the initial section of the program- Write & Improve workbook as it is available free of charge. Both teachers and participants can create their own profile and sign in to access various writing task for every CEFR levels. Each CEFR level has sample scripts for reference. Additional section of W&I Business and W&I Just for Fun are available for specific learners. The Test Zone section provides tasks for International Cambridge Exams- IELTS General, IELTS Academics, B2 Frist Training. Class View section has additional ready-to-use tasks.



**Fig.1: Interface of Write & Improve**

Marianne Mikolov, an advocate of corrective feedback, states that it's a traditional but effective way of assessment of written tasks. Corrective feedback provides critical views and comments for students' works. Though Indirect corrective feedback: highlighting, underlining and coding, students come to know the concern areas and can-do self-correction and self-reformation.

In this research, it was found how AI algorithms are used in the tool 'Write & Improve' in language learning and teaching with the main focus given to the writing tasks. The criteria of corrective feedback in the tool 'Write & Improve' is tabulated below:

Criteria of corrective Feedback	What does it assess?
Content	Extend to which the learner has completed the task.
Communicative achievement	Appropriateness of the written tasks.
Organization	Structure and format of writing
Language	Use of lexical and syntax.

**Table 2: Corrective feedback criteria in W&I**

It is a platitude, that AI has revolutionized academic systems. It is extensively used in class and out class. AI using AWE tools (e.g. Write & Improve) are providing automated feedback on errors in students' tasks. Moreover, they provide constructive feedback on the components of writing rubrics like organization and development of ideas. (Liu & Kunnan 2016).

Various writing techniques are used to enhance writing skills, one of them is Process Writing where both students and teachers collaborate to produce a written text. 'Write & Improve' utilizes this process writing method for meeting Cambridge criteria for assessing writing (content, communicative achievement, organization and language).



### Evaluation of Write and Improve AI tool

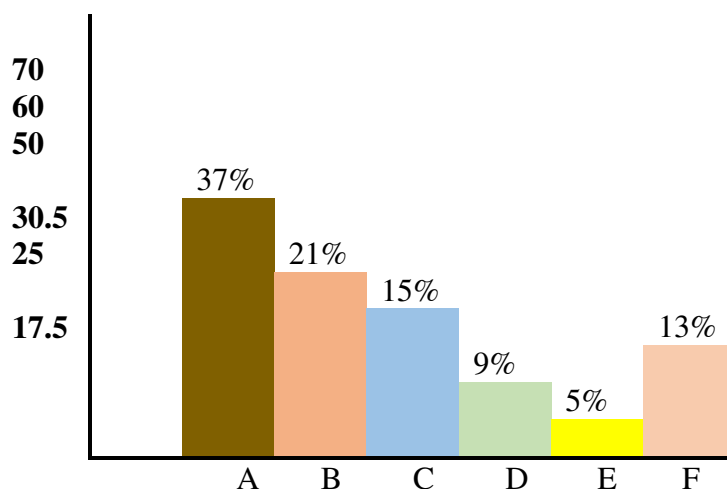
The objective of this paper is to prove the research hypothesis that AI integrated online language tool ‘Write and Improve’ can help students help develop and enhance their writing skills. To this purpose the interviewers were asked the following questions:

1. Are you satisfied with online teaching?
2. Are you familiar with AI driven online tools?
3. Is the online AWE tool ‘Write & Improve’ effective means of improving writing skills?
4. Does AWE tool ‘Write & Improve’ facilitate the process of learning?
5. Is the process of learning with the AWE tool ‘Write & Improve’ enjoyable than other software?
6. Is write and improve feedback more efficient compared to teacher corrective feedback?

As part of this study ,the secondary students of VIBGYOR High, Airoli were interviewed to find out the feasibility and success rate of integrating AI driven AWE tools in English teaching, learning and assessment.

### DISCUSSION

The findings of the experiment is clearly stated in the bar diagram below (Fig. 3). From it we can conclude that majority of students (37%) find AWE tool effective both for online and offline language study.9-5% of the students find online tool enjoyable. Finally, the research establishes the truth that employment and usage of AI driven tools in language studies in secondary level enhances various communicative competencies. Specifically, AI driven online tool of ‘Write & Improve’ is considered by the students both effective and enjoyable way to hone up writing skills.



**Fig.3.**

- A- Approve online teaching.
- B- Familiar with online teaching aid.
- C- Students familiar with AWE tool ‘Write & Improve’.
- D- Students find AWE tool ‘Write & Improve’ effective.
- E- Students find ‘Write & Improve’ enjoyable.
- F- Students appreciate W&I feedback.



### CONCLUSION

In recent times there is a deluge of AI driven language learning tools. In 2018-22, USA has seen 48% growth in AI market. India has seen a rise of 12% in 2018-22, in implementing in education system. AI technologies have great potential in education and language learning, in particular to increase access to learning opportunities, to scale up personalized learning experiences and to optimize methods and strategies for desired learning outcome. Experiments in the field of English language teaching has shown positive result of using AI driven AWE tools which make academic courses more dynamic and intense, help organize the process more effectively, enrich the communicative competencies, provides positive motivation while facilitating the independent work of the learner. Based on the analysis of the study result following conclusion was derived:

1. The use of 'Write & Improve' tool established its efficiency and practical utility in the sphere of English Language study.
2. Implementation of AI driven AWE tools is more likely to help enrich individual learning and assessment.
3. Corrective feedback has positive influence in writing tasks as it helps to avoid subjective human assessment.

### LIMITATIONS AND RECOMMENDATIONS

This study is by no means comprehensive and has its limitations, more questionnaire statements along with wider variety of options could be employed, preceding in-depth interview with the research participants. The research sample in future studies could be larger, possibly involving research participants from more sections and schools. In this study we evaluated the efficiency of 'Write & Improve' online tool designed to facilitate students' writing skills, further studies may focus on integrating other tools online (e.g. Speak & Improve by Cambridge Assessment English) in EFL practice to boost communicative expertise. Future research can also include Language bots, Machine translation and personalized text books.

AI driven English Language apps and online tools are fast increasing and becoming popular among learners worldwide. But there are still unexplored fields in this area that deserve the attention of researchers and practitioners. As Finn had emphasized back in the 1960's, technology is "more than an invention- more than machines. It is a process and way of thinking." The growing AIED research would result into more practical guidelines and example for educators, together with new way of teaching and learning.

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### ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON VALUE CREATION

**Ms. Rakhi Vivek Kansara**  
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#### Abstract

*“The Science of today is the technology of tomorrow.”*  
*“Science is the poetry of Reality.”*

Science is the most beneficial channel of information. Values are the ideals that inspire persons to react to varied situations. Artificial intelligence is the branch of applied science which builds machines comprising of human intelligence. The main aim of the research is to find the impact of artificial intelligence in terms of value creation. The survey proves that artificial intelligence has both positive as well as negative impact on value creation just like the two sides of the coin.

#### INTRODUCTION

Science finds out solutions for traditional of living and helps us to answer the nice mysteries of the entire universe. Values are considered in both social and economic means. Artificial intelligence is the need of the hour. The aim of the research is to seek out the impact of Artificial intelligence in terms of value creation. Case Study Research involving Simple random sampling via the survey method helped to attain the objectives. The survey proves that Artificial intelligence has both positive additionally as negative impact on value creation a bit like the 2 sides of the coin.

#### Objectives

1. To study the effects of artificial intelligence on students' psychology, thoughts, feelings.
2. To study the impact of artificial intelligence on physical and mental health of students.
3. To explore the effects of artificial intelligence on value creation and retention.
5. To explore the effects of artificial intelligence on environment.
6. To create awareness about the importance of values and its diminishing nature in new generations.
7. To understand the amount of capital involved in artificial intelligence.
8. To explore and predict the future of artificial intelligence in students' lives.

#### **Theory -Review of the related studies Indian Studies**

##### **Study 1**

- Name of the Researcher-Suman Bhakri
- Title of the Study-Artificial Intelligence applications and implications for Indian economy
- Objectives-To understand the significance of artificial intelligence for the Indian economy.



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- Findings/Conclusion-The world of tomorrow will be driven by knowledge, machine intelligence and digital pathways, to prepare ourselves for this transformation and explore its limitless opportunities, new deeper research orientation, creative economy by “Ideation, Innovation and Incubation” required for nation building and to meet the needs of 21st century. Microsoft aims to focus on meaningful innovation for lasting impact.

### Study 2

- Name of the Researcher- Mansi Kedia and Richa Sekhani
- Title of the Study- Potential Impact of Artificial Intelligence on the Indian Economy
- Objectives- To find out the impact of artificial intelligence on economic value creation.
- Findings/Conclusion- Innovation complementarities and dynamism have the potential to radically alter productivity unambiguous impact of AI on productivity of Indian firms. Relatively big firms in India and the potential impact AI can have on the industry as a whole. Econometric estimation finds a positive and significant relation between AI intensity and total more precisely, a unit increase in AI intensity by Indian firms can lead.

### Studies Abroad (International)

#### Study 1

- Name of the Researcher- A. M Cox
- Title of the Study -Exploring the impact of Artificial Intelligence and robots on higher education through literature-based design fictions
- Objectives-To explore the positive and negative impacts of Artificial Intelligence on Higher education
- Findings/Conclusion- Fictional design imagines future scenarios using AI or robotics which helps to interpret and interrogate technological possibilities. The paper also describes the use of an extensive narrative literature review to develop eight such design fictions that capture the range of potential uses of AI and robotics in learning, governance, and research.

#### Study 2

- Name of the Researcher- Michael Chek – Tek Tai
- Title of the Study- The impact of artificial intelligence on human society and bioethics.
- Objectives: To explore the positive and negative impacts of AI on human society and bioethics.
- Findings/Conclusion- AI is here to remain in our world and that we must try and enforce the AI bioethics of beneficence, value upholding, lucidity and accountability. We must not let computers make important decisions for us because AI as a machine will never possess human qualities like compassion and wisdom to morally discern and judge. Bioethics isn't a matter of calculation but a process of conscientization. Although AI designers can up-load all information, data, and programmed to AI to function as somebody's being, it's still a machine and a tool.

### Experimental

The researcher had used percentage-based techniques (quantitative) for analysis of the research via the survey method. Researcher used the questionnaire as a tool for data collection where in



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information from variety of people was collected. The data was analysed using the representation the pie diagram. The researcher had used descriptive analysis method. Descriptive analysis was used to describe characteristics of sample. The statistical measure used were Percentage (%) and Pie diagram

### Major steps in survey method are as follows:

1. Preparation of plans
2. Preparation of adequate tools
3. Questionnaire
3. Tests
4. Rating scales
5. Score cards
6. Interview schedule
7. Data gathering
8. Analysis and interpretation of data
9. Preparation of the report- recommendations and conclusions.

### RESULT

Response	Always	Mostly	Sometimes	Rarely	Never	Total
Score	9	23	26	3	1	62
Percentage (%)	14.5	37.1	41.9	4.8	1.6	100

INTERPRETATION- It was noted that 14.5 % students always, 37.1 % students mostly, 41.9 % students sometimes, 4.8 % students rarely and 1.6% students never believe that technological tools and devices will have a negative impact on Value Creation.

CONCLUSION- 41.9 % students believe that sometimes technological tools and devices will have a negative impact on Value Creation. Hence, we need to be cautious and take necessary measures.

Response	Always	Mostly	Sometimes	Rarely	Never	Total
Score	3	17	27	13	2	62
Percentage (%)	4.8	27.4	43.5	21	3.2	100

INTERPRETATION- It was noted that 4.8 % students always, 27.4 % students mostly, 43.5% students sometimes, 21 % rarely students, 3.2% never believe that technological tools and devices will have a positive impact on Value Creation.

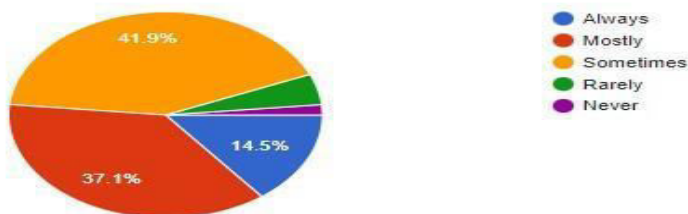
CONCLUSION- 43.5 % students believe that sometimes technological tools and devices will have a positive impact on Value Creation. Hence, we need to get the fullest benefit of it.

### DISCUSSION

Post COVID, artificial intelligence and value creation must be co-related in order to take a step towards technology as well as mankind. This modern era especially post COVID has made humans rely upon gadgets and internet

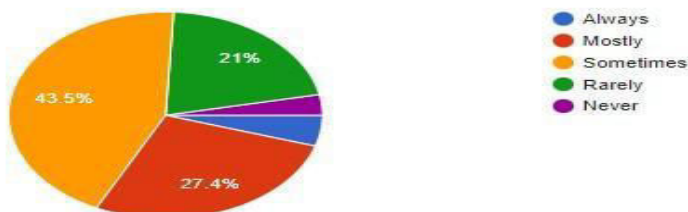
19. Artificial intelligence will have a negative impact on values creation (ethnic, moral and economic ).

62 responses



20. Artificial intelligence will have a positive impact on values creation (ethnic, moral and economic ).

62 responses



### CONCLUSION

Bioethics must be transcendental to bridge the shortcoming of AI's inability to empathize. AI is here to stay in our world which we must try and enforce the AI bioethics of value upholding, lucidity and accountability. Bioethics isn't a matter of calculation but a process of conscientization. Future research is suggested to perform extended studies a spread of scholars where different age groups is included.

### ACKNOWLEDGEMENT

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### HOW SHIFT IN THE ROLE OF TEACHERS IN THE TEACHING-LEARNING PROCESS IMPACTED LEARNERS DURING THE COVID-19 PANDEMIC?

**Silika Shetty**

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#### **Abstract**

This paper focuses on the shift that was witnessed by teachers due to their teaching - learning process on students' education. The Online platform hit hard all the students who initially took everything less seriously. The main issue that is discussed here is the change in behaviour pattern and attitude towards learning. Casualness has entered and discipline has disappeared. The solutions to the problem identified is mentioned at the end of the paper.

**Keywords:** pedagogy, retention, WFH, Response

#### **Introduction**

Martin Weller, the author of 'Delivering Learning on the Net' would have not anticipated the number of online learners in the years that passed by. The book that was first published in 2002 talked about distance learning and the benefits of it. Weller says that the net has increased the 'verbosity of the world'. Change -from 2002 to 2020, the world witnessed an entire transformation

- courtesy COVID -19. Online learning became the rage as offline had to stop so that the coronavirus spread is decreased. The outcome of online learning was a drastic impact on learners who had to learn in a condition with virtual teachers and computerised net-oriented feelings.

There has been many statistical data about the effect of online studies on students due to the change in the role of the teaching of a teacher. This research will focus on the Online learning of students in the interior of India. The quantitative research will hypothetically generalise the fact that learners all over the country faced the similar problem, thereby facing challenges in the consecutive years.

The teaching -learning process which was impacted on the learners during the Covid -19 pandemic will concentrate on the changes that occurred in the behaviour, social, psychological and educational transitions that was, and is seen in learners in Covid -19. The reading and understanding of this paper will minimise challenges in teachers and students who ought to come out of the situation and lead to a normal education. Only acceptance, certain changes in self and ways to plan out the problem can pave the path to a more scholarly way of learning in both - Offline and Online. The results provided in this paper will thoroughly ensure the treatment towards Online learning, which has now taken up a prominent role in pedagogy in education.



### Theory

On reading a few sites and books on Literature review- like Bawa P. Retention in Online Courses: Exploring Issues and Solutions—A Literature Review., Wu, X., He, Z., Li, M., Han, Z., & Huang,

C. (2022), An effective blended online teaching and learning strategy during the COVID-19 pandemic it is understood as a generalised fact that Online learning had a drastic impact on students not only for the lower grade learners but also for the higher and professional course seekers. The effect of learning-on-learning disability students was a complete disaster. Online studies were not helpful to them. The atrocities that the grammar, vocabulary, solving sums and trying to understand concepts was completely ruled out in their cases. In another review the retention rates of students were seen as an issue that was worrying. Yet another review focused on the games that students played during the Online sessions.

However, the gap that remains prominent is the challenges faced by students. The set changes that were seen in behaviour, social, physical and intellectual changes brought about a gap in learning. Knowledge that was once in the classroom, was soon disturbed by the atmosphere of home for some students (parents WFH {work From Home}, siblings online learning) and for other students the challenges was the blended or hybrid mode of learning.

Thus, the objective to satisfy the research topic, a questionnaire was used.

### Methodology

This Research paper is expository in nature. It is data based and has used the survey method. A structured questionnaire was made and sent to a school where 14 respondents were received from teachers as research samples or piloting the study. The study was administered in Chhindwara district, in Madhya Pradesh, by sharing the Google form link with closed ended questions. The study formulated 17 questions (6 questions / statements were personal details including e-mail, Name, Age, Gender, Town/City/Country and teaching in specific category) and descriptive statistics to draw the insights from the respondents, used in the study questionnaire.

### Result and Discussion:

Following is the table which will give an idea of the piloting survey done in Chhindwara . Questions 1 to 6 were personal details of the respondents

Sr.no	Questions	Option	No of Respondents	Percentage
1. (7)	Did you face any of these problems?	A) arranging a device immediately	3	21.4
		B) extra expense on Wi-Fi, gadgets and other tech related items	6	42.85



		C) power cut / load shedding	5	35.71
	Total		14	
2. (8)	Tick the problem/s below if you have faced it?	A) interaction with students was difficult	12	85.71
		B) providing fake reasons to avoid a situation was more in Online	2	14.28
	Total		14	
3. (9)	Which platform did you use to teach Online sessions?	A) Microsoft Team	0	
		B) Google Meet	12	85.71
		C) Zoom	1	7.14
		D) Other	1	7.14
	Total		14	

4. (10)	Was using videos and slide shares an effortless way of teaching?	A) Agree	11	78.57
		B) Disagree	3	21.4
	Total		14	
5. (11)	Were the students able to learn better with the videos, ppts, websites or online exercises?	A) Yes	5	35.71
		B) No	9	64.28
	Total		14	
6. (12)	Was students' attendance a problem?	A) Yes	13	92.85
		B) No	1	7.14
	Total		14	





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7. (13)	Did students ask for clarification after the session got over?	A) Yes	6	42.85
		B) No	1	7.14
		C) sometimes	7	50
	Total		14	
8. (14)	Were you satisfied with the result in every Online exam?	A) Yes	7	50
		B) No	7	50
		Total	14	
9. (15)	Did you suspect plagiarism or malpractices from the students end?	A) Yes	4	28.57
		B) No	10	71.42
		Total	14	

10. (16)	What behavioural changes did you observe in students during your online sessions?	A) not willing to answer when asked a question	6	42.85
		B) bothered about what the other students will say	0	
		C) asking questions which are not in the syllabus	0	
		D) camera shy	7	50



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		E) speaking with arrogance	1	7.14
	Total		14	
<b>11.</b> (17)	Did your students wholeheartedly participate in the co-curricular activities?	A) Yes	10	71.42
		B) No	4	28.57
	Total		14	

The responses that were received had similar facing problems.

R7-1 asked about the problems the teachers faced during the shift in their teaching - learning process in Covid 19 which had an impact on the learners. 42.85% teachers faced a problem with devices, Wi-Fi, and gadgets- arranging it initially and later learning to master the skills of Online teaching. A small district like Chhindwara faces shortage of electricity which is another hindrance to teach. Learners though willing to learn also faced problems that are grave and hampered learning.

R8-2-85.7% agreed to this. Students away from school in Chhindwara could not join the online Google Meet platform due to data issues and connectivity. Students suffered with this condition and were at a loss of proper academics.

R9 -3-85.71% joined through G Meet a platform that is does not charge anything from its user. Maximum students availed this service due to their financial status and the faith in it.

R10- 4- 85.7% agreed that the sessions were easy for the teachers when the students watched educational ppt's and videos and played quizzes.

R11-5 Online learning might not be a viable choice for the students in Chhindwara as 64.28.% learners did not enjoy the ppt's and videos shared by the teachers.

R12 -6 -92.85% students remained unattended in Online sessions. Thus, it will be seen as a major loss

R13 -7 -50% students asked the doubts after the sessions which is fairly a decent number but the others cannot be ignored as the reasons may vary and cannot be thought as students who do not wish to learn.

R14 -8-Teachers had a neutral reply for the results of students.

R15 -9- 71.42% teachers suspected plagiarism. This shows the students inclination towards vices over virtues during Online learning.

R16- 10- Some students were camera shy and so 50% of the students according to teachers did not open up themselves.

R17 - 11- A figure of 71.42% students participated in the extracurricular activities Online. It might be the National festivals or competitions that were arranged by the school

Teachers agreed that the attendance was a problem and the shift of teaching - learning process to Online was easier for learners for escapism. Avoiding interactions by not enabling the camera was a common condition. Attendance was a ubiquity being ubiquitous. 50% of the students did



not bother to clarify their doubts during or after their online classes. Though it was a neutral response for the exam result on the online platform [ the 71.4% plagiarised or malpractice in their examination]. To add up, not willing to answer in the online sessions was a neutral number.

### Feedback and suggestion-

From the overall responses it is observed that certain changes in Online learning can create a major difference in -

- Facility provided to learners- ample of resources will make their education easy and chances of more scholars in the future for the country is inevitable
- Interaction with teachers need to be taken seriously with intervention of the guardian or the parent in Online learning, especially if the learner is an introvert.
- To draw in attendance into online learning the students need to be under the vicinity of parents and they need to be oriented very often about the progress of the learner.

### Conclusion -

The overall effect of teaching Online has been a paradigm shift in the field of education. The students learning affected so much that they are unable to write notes in the class, they suffered from boredom, they have nothing to fidget so they became restless. Their habits and behaviour have changed. Getting irritated, arrogance and certain health issues added up to the problem. Rural areas had an entirely different situation. Though the students were ready to learn they could not get enough resources. To curb the existing problem the government should take the onus of finding loop holes and try to fund schools in rural areas where support for the Online platform is provided. Apart from the gadgets they should also be provided with a teacher who is really good in computer skills. If the rural area is ignored then the future of the country, its children and adults will be devoid of professionals.

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### CAREER SECURITY OF INDIAN SPORTSPERSON

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#### **Abstract**

The Indian sports industry is gradually growing with many new schemes, competitions and are also encouraging sports other than just the mainstream ones but, there is still a lack of career security for the sportspersons. After retiring from playing sports, they face a lot of challenges in terms of finance, mental health and lack of education. Their career is vulnerable, and with less longevity compared to other professions. In India, the career security of sportspersons is overlooked which is why the young aspiring people tend to choose other careers over a sports career. In this study, we take a deep dive at what are the challenges that sportspersons face and how we can help them. The Delphi analysis was used to understand the personal experiences and choices of experts to get a closer look at various aspects of career security.

**Keywords:** Career security, finance, mental health, education, vulnerable, longevity and Delphi analysis.

#### **INTRODUCTION**

The national sports budget for 2022 is increased by ₹ 305.58 crores [1]. It is a 30% increase from the financial year 2021 to 2022. This increase in the budget allocation was for the flagship scheme -Khelo India. This scheme is an encouragement for sportspersons to perform well however, even if the players perform well internationally, the aftermath of this victory is not a glorious picture. The former cricketer Janardhan Navale was India's first test wicketkeeper has a tragic story [2]. There are two explanations for his last days, One claims that he spent his last days as a beggar on the Mumbai-Pune highway, while the other says that he was a watchman at a sugar factory in Pune. Such a tragic story makes people doubt choosing a sports career as it seems to have less financial security. The sportspeople don't have financial support from the government so they feel insecure about their career. The sports budget this year was increased but there was no increase in the provision for aspiring sportsmen. Why is it that despite having an increase in the budget, sportsmen feel that their career is at risk after retiring? Such a grim scenario in the sports field can be discouraging for the future players and I, who have been a national-level skater for 4 years, am also no different. People who work in the sports field face quite a lot of challenges and do not feel secure about their future. It is a major downside of being an Indian sportsperson. A career in the sports industry comes with a lot of vulnerabilities. A sportsperson is more prone to vulnerability than a normal person seeking a job..There are many times different reasons why a sports person's career becomes vulnerable. Most sportspeople have a limited span of a career. This is due to fitness issues. If a sportsperson gets severely injured or



takes a long break, their career becomes unstable. Furthermore, if their playable age is gone, they are usually prone to retire from sports early, but their future career opportunities are limited. Additionally, players are also vulnerable to sudden policy changes which can bring their careers to a halt. For example, DipaKarmakar, a bronze medalist in the 2014 commonwealth games in gymnastics, was identified as suspended by the International Gymnastics Federation on the grounds of lacking a mandatory license[3]. It is believed that after retiring, the sports industry doesn't look lucrative. Thus, discouraging future sportspersons to pursue this path actively. In this study, we are trying to understand the current state of the Indian sportspersons who retired and the struggles they face while and after retiring. Thus, discouraging future sportspersons to pursue this path actively

### Theory

**INDIAN NATIONAL BUDGET ALLOCATED TO SPORTS** –Although the authorities have increased the sports budget under Khelo India, it is not sufficient to provide career security. The authorities have neither considered the career security of sportspersons nor have they allocated any funds in the Indian National Budget for the same [1]. Moreover, the government hasn't considered providing a structured ecosystem for the sports professionals to obtain a sustainable income option after retirement from the sports. Under the Khelo India scheme, the awards money was increased for the winning sportsmen. However, the monetary benefits received through awards and accolades are not sufficient drivers to keep the financial interests of the sports person in the long run. A major drawback of this budget is that there is no provision for sports preparation i.e. proper training and equipment for sportspersons. If they lack proper training and equipment, they are more vulnerable to injuries which can affect the longevity of their career. Rehabilitation for such sportspeople who retire due to physical injuries is not available. Thus, despite the budget increase, career security remains a prime concern whether it be a winning sportsperson or an injured sportsperson.

**MENTAL HEALTH** - Retiring from sports is like coming back after participating in a war. Sportspersons break their whole disciplined routine after retiring. They feel unconnected suddenly as they were so busy with sports before, that they don't know what to focus on now. They don't have any social connections with the people outside and don't know how to reconnect with them as they are very concentrated on sports. Sportspersons are known for their game. Their identity is based on their sports but after retirement, they lose their social identity. They lose what they were defined by. This is how their mental health takes a toll. With no social bonds, they don't know whom to trust. They lose their prime youth to sports. They do not have enough practice to get into a different profession as they have discharged their duties as a sportsperson.

**EDUCATION AND SKILLS** - Since they spend more time perfecting the skills they require in the game, they don't find time to learn other skills. Whether it be a renowned mainstream sport like cricket or any other sport, both have expressed concerns about lacking soft skills. Kapil Dev, the former captain of the Indian cricket team is an inspiration in every Indian's eyes but he struggled to get through the social barrier as he did not know English well[4]. In a recent interview, Kapil Dev revealed that he used to find a place to hide whenever Srinivas Venkataraghavan was around. In one of his interviews, Kapil Dev says, "I was very scared of Venkataraghavan. Firstly he only used to speak in English and secondly, we all know his anger.



Even when he was an umpire, he used to give not out in a way as if he was scolding the bowler. When I went to England in '79, he was captain, I used to find a place where he couldn't see me." Even though sportspersons do a commendable job, they are overlooked as they lack social skills. For their career to be secured they need to know social skills. Some soft skills which could help the sportspersons are - communication skills, ethics, organizational skills and networking skills. Sportspersons can use these skills to interact with the media or the public [5]. This will benefit them as they would become more approachable and would also attract sponsors' attention. Furthermore, having a degree in the sports field would open up career options even after retirement. Thus allowing the sportsperson to pursue their passion in a sustainable environment, mastering soft skills or having a proper education instead would give them more security as they would be better able to navigate their professional and social circles.

After analyzing these studies, it is vital to understand the sportspersons' personal experiences in terms of the educational, mental health and financial challenges they faced. It is important to analyze what happens to their life after retiring from playing sports as it will help make better educational and financial policy decisions to provide them with a sense of career security after retirement. This study aims to get an inside view of whether the career of an Indian sportsperson is secured and how we can help them.

### Experimental

In this study, the Delphi analysis was used to try to understand and bridge the gap. The Delphi analysis is a research method which analyzes the opinion of a group of experts through interviews. Interviews of 5 experts were taken who have been in the non-cricketing sports field for a long time and now are professional coaches and trainers. Interviews of experts from sports other than cricket were taken to get a diverse opinion about aspects of career security in a non-commercial sport. A mix of those experts who have retired from playing sports and are only focusing on coaching as well as those who are still playing in championships while coaching simultaneously was taken to understand the long-term choices of players and how they can or cannot result in a secured career. All the experts have 5 to 20 years of experience and have played and trained at the national level. All experts have pursued higher education - from undergraduate to master's degree. Their income lies in between 20k to 30k. This survey is trying to analyze the challenges these experts have faced in terms of finance, mental health and education. After being in the sports industry for a long time, what were their aspirations and whether their career would be more secure if they had learned some other skills? The intention of asking these kinds of questions was to reveal the reality of career security by analyzing their personal experiences on the common factors of financial, mental and educational challenges they faced.

### RESULT

**FINANCE** - About 60% of the experts were able to manage finances but still faced challenges like more working shifts, no fixed income, the fee structure of training institutions and other financial problems. Also, when asked about financial expectations from the government, most experts expect a better sports infrastructure in general. In addition, they did not receive any pensions from the government after retiring from playing sports.



**MENTAL HEALTH** - While all of the experts are happy with what they do currently, however when asked if they could have learned any other skill, 60% of the experts agree that they could have spared time to learn other skills to be more secure. When asked about the factors which made them quit sports their answers revealed that work pressure, higher education, job, income and overall skill development were some of the factors that lead them to this decision.

**EDUCATION** - 80% of the experts think that they could have spared time for education and sports. 40% of the experts said that there was a roadblock from universities and colleges to getting admission. When asked if they would want to pursue their education and have a better career instead of a sports career, all of them denied it and said that they would stick to sports. They are all passionate about sports but when asked if they feel secure enough about their career, 60% of them were feeling unsure.

### DISCUSSION

In After exploring the personal experiences of the experts, here is what was found. In terms of financial factors, the main aspect was that the experts who were interviewed did not receive any pension or any kind of fund after and during retirement. No financial support by the government is given to the retiring sportsmen, which makes it unstable for the sportspersons to manage their finances in the long run. Furthermore, even after playing at the national level, the majority of the sportspersons could manage their finances with their career but faced problems like no fixed income. The analysis exposes that there is no secure amount of income as the fee structure of sports institutes is unorganised which makes their income unstable and their careers insecure. In terms of mental health, every expert agrees that they are currently happy with their work but most experts regret not saving time to learn any skill that would be useful to them. Some factors due to which they quit sports were how they received a lot of pressure from the work which made it stressful and rigid to work. In respect of education, Most of the experts think that taking more time out for education would help them now and that they could have better opportunities for a secured career with more education. They also retired from sports to pursue higher education to make their future more secure. Chasing a better and more secure job also made them retire from sports. The sports career wasn't lucrative enough as they had to work harder to earn an amount of money which they could have easily earned if they had chosen to pursue a desk job These instabilities and vulnerabilities were the reasons why the experts retired from sports. One of the major vulnerabilities was regarding the longevity of their sports career, one major injury would ruin their entire sports career. The sportspersons would need more stable education and framework practice to get a different secured job if they retire early. They all wanted to have their career only in sports when asked about what else they could have been. There is no hindrance in terms of passion for sports but later then they faced challenges in terms of career security. All these factors indicate that more steps need to be taken to make their careers stable after retirement.





### CONCLUSION

In From this study, it can be concluded that the government should focus on the career security of the sportspersons and the sportspersons could always learn other skills to ameliorate their career and get better options after retiring from their career. It was found that after an early retirement from sports, the sportspersons have difficulties getting a new job. Moreover, they have problems socializing with people as their identity was based on their sports career which is now over. The study shows that more should be done to help the sportspersons so that they feel more secure to choose this career path and make their journey easier. The examples and analysis explain how the Indian sportsperson's career is not secured enough, making the next aspiring sportsmen think twice about choosing this career path. Awareness about the career security of sportsmen must be spread amongst the community to make people realize how unstable a career in the sports industry has become. To help them, the government must allocate funds to retired sportspersons. We need to bust the myths about this industry. A sports career doesn't seem quite sustainable and lucrative, but being mentally prepared for challenges in the financial, mental health and educational factors could support the sportsperson and make them alert about what to work on for having better longevity and security in their career.

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### MILITARY COMMUNICATION: ITS ROLE IN THE DEFENSE OF A COUNTRY

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#### Abstract

This paper discusses on the topic of Military communication and its importance. Research is discussed on topics such as mediums of communication for the military, profits of having a good communication system in the military, and safeguarding communications from unwanted personnel, via encryption. Research indicates that a good communication in the military has shown a significant advantage to the same.

Keywords:- *Mediums of communication, Defense systems, Profits of communication Encryption*

#### Introduction

In September of 1939, leading the German invasion of Poland, World War 2 begun. This war is, to date, the deadliest conflict in human history. Enigma was an encryption device made by Germany, which encoded letters from messages to different letters such that the chances of you guessing a letter correctly was approximately 1 in  $1.59 \times 10^{20}$ , which is 159 followed by 18 zeros. This gave Germany a huge advantage, since they could intercept and decrypt British messages much easier, whilst for the British it was nearly impossible. Alan Turing, in 1940, devised a machine to decrypt enigma letters, which were intercepted everyday via radio. This gave the Allies an advantage again, as they were able to collect valuable information such as dates and locations of naval attacks. This feat has been said to reduce the duration of the war by 2-3 years, saving millions of lives. This shows us the importance of communication in the military and in the defense of a country as a whole.

#### Theory

First of all, we must actually know what communication really is. Communication is any act of sharing or exchanging information with another individual or group. In the context of the military, this can mean a lot of things, such as:

- The exchange of orders from an authority to the army.
- Sharing information during or after a mission.
- During a time of crisis, sharing instructions to people for their safety.

And a lot more. To communicate, devices are made. In the military, sometimes they are modified to make them safer and make it harder for the enemy to get hands on internal information. Devices used can include:

- Radio systems
- Military phones that are modified to use VoIP



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- Intercom devices
- Remote control systems
- Data link systems

Etc.

Communication systems are also used for controlling defense systems. Some defense systems that are not autonomous need to be controlled by humans using remote systems. This eliminates the need of humans to be staffed at defense and even attacking systems 24 hours a day.

However, what advantages will a country that has modern communication have against a country without sufficient communication? Firstly, the former will be much more organized, since managing a huge army without good communication is troublesome. The former will also be able to respond to threats faster. The former will be able to plan and coordinate attacks faster and easier. Good communications help get valuable information of the enemy. These, among others, are great advantages and make it near impossible for the enemy to be triumphant.

However, having good communications is nothing if they aren't safe; If it is easy for the enemy to get information, then that would be a massive disadvantage. So how is information safeguarded from the wrong hands? Encryption. Encryption is a process in which an original text, called 'Plain text' is converted into complex code called 'Cipher text'. This makes it much, much harder for unauthorized personnel to get information. The military uses two types of encryption, AES-128 and AES-256. The former is used for unclassified data, while the latter for highly classified data. The numbers at the end refer to the length of string of information. AES-256 is thought to be nearly unbreakable by brute force, since for any string of information, the number of possible combinations is approximately  $1.1 \times 10^{77}$ . That's an astronomically big number.

### Experimental

15 people were asked the question, 'Do you think that communication is necessary for the defense of a country?'. Following are the results from this survey:

*Table 1: Results of survey 1*

	Yes	No
No. of People	14	1

This clearly shows us that the general perception of people is that communication is necessary for the defense of a country.

### Result

Research shows that communications is vital for defense of a country. Without good communication, defense would be much less organized and coordinated.

### Conclusion

We can see the advantages of having good communication from research. It is used for control of defense systems. Medium of communications have to be chosen carefully, each device has a specific use. Also, safeguarding information is crucial, and encryption is used mainly.

### Acknowledgements

Miss Dimple, Trinity International School



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## DIGITAL MARKETING- SMALL SCALE BUSINESSES VS LARGE SCALE BUSINESSES IN FOOD AND HEALTH

**Nishita Vaswani**  
Euro School Airoli

### Abstract

The way of marketing products or services, for now, has changed. Currently, marketing does not have to be done by meeting in person. Simply by using the digital marketing application, entrepreneurs can make sales without being limited by space and time. However, the development of digital technology is not accompanied by the development of utilization by Micro, Small and Medium Enterprises. This means that not all entrepreneurs, especially micro and small entrepreneurs, utilize this technology. So small and medium entrepreneurs use the old pattern of running their business, especially in the marketing sector. Based on this, researchers conducted research using qualitative research methods to find out how these micro and small entrepreneurs run their businesses in the era of rapidly developing digital marketing technology.

**Keywords:** *Marketing , Consumers, Advertisements*

### INTRODUCTION

#### Digital Marketing

Ten years ago, the concept of using social media for business was foreign. Today, however, with the rise of giants like Instagram, YouTube and Facebook, many businesses see the marketing value in these sites. The boom of the social media influencer and content creator market has opened new doors of opportunities. Social media and influencers have evolved into legitimate ways for brands to reach their customers and generate income.

However, influencer marketing is not the only perk of investing in social media marketing as a brand. For small businesses and startups, in particular, there is a world of opportunity in that realm of hashtags, comments and likes.

#### Theory

Digital marketing is a technique where different companies can advertise and sell their services using a digital platform. It is really essential for small businesses as it gives them more exposure and popularity. Large scale businesses like to invest more in digital marketing to make more creative advertisements and keep their consumers hooked. It is really a very important factor in business as it is one of the most efficient methods of earning a large profit.



### Experimental

The best way to have a successful marketing strategy would be to add as much evidence as possible. Mention facts and public reviews to attract more profit. Small industries in healthcare and food which are not certified will lead to trust issues. They should try to get certified in order for people to trust them and their services. For large industries which are already certified should try to constantly send out new ads so that their consumers do not move to some other product. They need to be at the top of the industry. Certified industries have an advantage as they are already trusted by many people. They can add more biological factors like more nutrients or improved technology. This leads into people maintaining their relationship with the service. Both the small and large industries should have an attractive website or any such platform in that case which helps communication with the consumer easy. It should be fast and very efficient. [1]

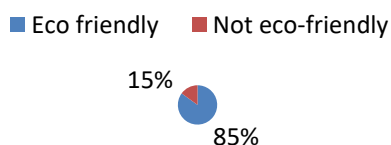
### RESULT

If the steps mentioned above are followed, an increase in income will be noticeable. How? Well since you are certified, many people will trust you and try out your products. If they do so, you can expect a higher demand in your service. And now that there is an easy and efficient portal for interactions, consumers would like to solve their queries and buy your products. Also the attractive ads bring in more people if it is something interesting to them. Adding public reviews show that the product has been used and that there aren't any issues with it.

### DISCUSSION

Mobile devices, excluding tablets, generated about half of all website trafficking globally.[2] This gives so much exposure to startups as it is one of the most approachable methods. It is easy to use and super user-friendly. It mostly contains most of the information needed to please a person browsing through the web. But, many people may not be recommended your site or not open you site as they may think it's a fraud. Also, consumers are around four times more loyal to eco-friendly businesses.[2] Majority of the public look for eco-friendly products to protect the environment. Adding that as a factor would be very effective as people would prefer your product above anyone else's. The global green technology and sustainability market size was valued at \$10.32 billion in 2020, and is projected to reach \$74.64 billion by 2030, growing at a CAGR of 21.9% from 2021 to 2030.[3] Globally, 85 percent of people indicate that they have shifted their purchase behavior towards being more sustainable in the past five years. [4]

### Percentage of Eco-friendly consumers globally





### CONCLUSION

In conclusion, I think that the main key to earn profit is to know what your customer wants and giving them exactly them. But how do they know that what they want is being offered by your company? The only way to let them know is marketing. Digital marketing is eco-friendly and influencer marketing or marketing on social media is one of the ways to grab people into the net of your services. I would recommend companies to generously invest in digital marketing and to get investors for your company who can guide you in the correct direction and use their fame to help you grow. At the end, what matters most is the satisfaction of the people. If that is fulfilled, then you know that you are on the right track.

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### MILITARY COMMUNICATION: THE REQUISITE OF THE PROGRESSIVE ERA

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#### Abstract

The desideratum of military communication has been oblivious to the general public and this paper ushers this topic into our political analysis. Military communication possesses a plethora of advantages which are yet to be unravelled. This paper gives evidence of how the military effectively manages itself giving vast majority of the credit to the communication equipment and how it closely knits the entire body into an imperishable hindrance non-allies have to overcome.

Key-words: *Military communication, Cryptography, Network-centric warfare, quality of superpower nation*

#### Introduction:

Military Communication, a specific yet broad term, often referred to as ‘comms’ comprise of all the methods used by armed forces to establish communication with their commander or headquarters and vice versa for a wide array of significant purposes that aid in reducing friction in their operations. All in all, there are six types of military communications-Alert measurement systems, Cryptography, Military radio systems, Nuclear-command and control, Signal corps and Network-centric warfare. Moreover, the verbal and textual communication carried out by the military includes the phonetic alphabet, meaning that they use words with starting letters of the alphabet they intend to use, for instance: A-Alpha, B- Bravo, etc. However, to comprehend the entire subject we need to understand certain terms of this field. To begin with, let us take a dive into “cryptography”- for basic comprehension, cryptography is the method of converting letters into various other characters so that only bodies equipped with decoding knowledge can crack the message preventing the unauthorized outflow of pivotal information. Next, let’s try to break apart “Network-centric warfare”- this segment of military communication refers to the attempts of a military body to decode encrypted messages of non-ally organisations. Lastly, “Signal corps”- refers to a military body that possesses a branch that operates all communications made by its armed counterpart. The objective of this paper is to evaluate the significance military communication holds in the development of a country and having a formidable defence amidst this rising strive for dominance by neighbouring countries.

#### Theory:

Based on recent publications in this field, a paper based on the role of communication in military leaderships, communication can be of two types- Informational and motivational. The aims of communication and leadership are synonymous. Moreover, the amount of effective





communication a commander has with his/her subordinates affects the strength of his/her ties with their subordinates, and the puissance of a military body depends on how clout the bonds between their soldiers are, as about 93% of a message is the tone and body language of the speaker.

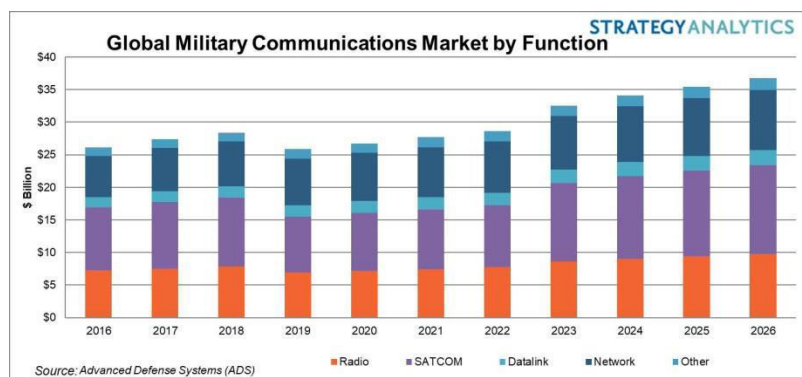
Furthermore, experts discuss about how pioneering military communications equipment usher copious benefits into a country's warfare system, in a paper based on high millimetre wave bands of military communication. They go on to claim that Avant-grade communications equipment aids a military organisation to make spontaneous decisions and set-up an elaborate yet efficient management of automated counterparts such as UAVs, etc. A good military communication system allows that organisation to establish communication conveniently with back-up supply systems for troops on the battle-field such as communicating with aerial re-fuelling vehicles, etc, which are essential for the survival of those troops. The most pivotal thing the military possesses is their troops; military communication is highly needed in order to given them information in the nick of time by which human as well as material resources is utilized wisely. Lastly, methods such as cryptography prevent the outflow of significant confidential information such as coordinates and secret identities of spies designated to very crucial missions. As each one is cognizant of the 5 traits a superpower country possesses- Large population, robust economy, and *Appreciative military power*, great political and cultural influence. A powerful military requires a tonne of up-to-date equipment and the wonder-child of this progressive era- Automated weaponry. As mentioned above, military communications fulfils all these needs of country to strengthen its defence systems. Lastly, in order for a country to gain leverage over the others is to have an adaptive military approach meaning that the military should constantly be updated with real time information to eradicate any leverage against them possessed by other countries.

### Results:

This evaluation clearly indicates how crucial of a role military communication plays in the growth of a country. This evaluation helps us to comprehend how intense things can get on the battle field and how communication swoops into to get them out of jeopardy. Thus, the final arguments of this analysis prove the worth of military communications to a country.

### Discussion:

This derivation really ignites the spread of an unprecedented perspective taken upon by the progenies of the 21<sup>st</sup> century. The comprehension of the results and evaluation stated above rewrites the necessities of how a military of a country can be managed in order to for it take lead into becoming an eventual superpower. As we are all cognizant of the fact that The Unites States of America is renowned for being identified as a superpower. As mentioned above, the troops and the devices that belong to the military are highly essential. However, the one thing ignored is the role played by military communication.





The above graph forecasts the military communications market *globally*. Notice how the market is predicted to grow exponentially connoting that countries are expected to invest in this sector subtly proving its credibility.

### Conclusion

With this, the paper has arrived to its culmination proving what a pivotal role military communication plays in empowering a defence system of a country. However, no matter how many facts indicate to the results obtain, there are a plethora of limitations that creep ip like a tenebrous shadow. The results obtained depend on the way it is executed, for instance having state of the art equipment but not utilizing it in the right direction is futile. Moreover, the audience for which the system was originally introduced must possess the comprehension skill of the fundamentals of this system. Many such limitation follow however, the results here are generalised and have a neutral perspective.

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## EVOLVING HEALTHCARE SYSTEMS THROUGH DIGITALIZATION

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### Abstract

Computational modeling and simulation have time and again modified the way medicine works – from curbing the spread of pandemics to creating highly complex images of the human body. This research paper aims to analyze the effect of the above on medicine. Surveys and interviews were uniquely conducted to delve deeper into the subject. In conclusion, computational modeling and simulation can evolve medicine in ways we haven't imagined before. We rely on simulation to transform the world around us...now is the time to transform the world within us.

**Keywords:** *Modeling, Simulation, Technology, Medicine*

### INTRODUCTION

Computational systems can be defined as the systems that are capable of solving a problem that includes calculations either mathematical or logical and can produce the result as an output. Modeling is the process of representing a model which includes its construction and working. This model is similar to a real system, which helps the analyst predict the effect of changes on the system. Simulation of a system is the operation of a model in terms of time or space, which helps analyze the performance of an existing or a proposed system.

In medical research and training, three major models are used – living, cadaver, and computer simulation. Living models are where live animals or plants are used for research, while a cadaver is a dead human body used by medical students, physicians, and other scientists [1],[2]. Over the past years, the usage of computational models and simulation has grown exponentially in various medical fields, from microbiology to oncology, radiology to dentistry. Medicine hasn't been the same since.

However, numerous doctors haven't been able to work with the same or turn it down due to various reasons. The objective of this paper is to explore various ways in which computational models and simulation have changed medicine and the manner through which they may evolve healthcare in the future.

### Theory

Computational modeling and simulation have numerous applications in medicine. I would like to list a few here:

- **Monitoring the spread of infectious diseases** – Healthcare experts can monitor infectious diseases in a specific area using computational modeling and simulation, allowing them to give a more effective response. It is possible to predict the way the disease may spread further, which may allow them to put risk individuals under



surveillance, thus reducing the spread of the disease. This came of great help during the COVID-19 pandemic, where governments could easily identify individuals at risk and save lives. This adversely changed the way how we responded to pandemics [3].

- **Medical imaging** – Computational modeling and simulation play an important role in radiology. It is extremely useful in lung screening and diagnosis of breast cancer. Data from X-rays are used to determine a patient's exposure to viral respiratory diseases and to assist clinicians to focus on the most susceptible patient groups. Predictive models and Digital Breast Tomosynthesis (DBT) give a complete view of breast anatomy and enable the early detection of breast cancers. An important example here is the University of Montreal Hospital Centre, where AI is used to identify disease-stricken areas using X-rays. This approach also aids in the preparation of patients for surgical treatments based on predicted outcomes [4].
- **Improving glaucoma diagnosis** –Glaucoma is the primary cause of irreversible blindness in the world. The condition is associated with increased intraocular pressure (the fluid pressure within the eye), which puts pressure on the optic nerve head and destroys the nerves that connect the light-sensitive cells of the retina to the brain. Because intraocular pressure is the primary modifiable risk factor for glaucoma, precise measurement is critical for effective disease management. Until recently, the rigidity of the cornea – the front window of the eye – impacted all intra-ocular pressure measuring techniques, resulting in both false negatives and false positives in glaucoma risk assessment. According to research, inadequate measuring has also resulted in 15% of glaucoma patients losing their eyesight within 15 years of therapy. To solve this issue, researchers at the University of Liverpool employed modeling to create novel methods for estimating the biomechanical behavior of the cornea and measuring intraocular pressure. These techniques have been implemented in a widely used commercial glaucoma diagnostic gadget, benefiting hundreds of thousands of glaucoma sufferers worldwide [5].

### Future Potential

Computational modeling and simulation have a long way to go in medicine. From assisting doctors in surgeries to helping in training doctors, the possibilities are endless. Cardiac surgery offers a wide scope for computational modeling and simulation. An important project integrating the two is The Living Heart Project (LHP). LHP's ultimate objective has been to build a large computer simulation model of the human heart that can subsequently be used to test various devices and drugs and educate people on how to perform various procedures. Essentially, a virtual heart on which surgeons can execute virtual experiments [6]. In the future, this project may reduce the burden on clinicians and aid them in more successful procedures.

### Experimental

To find out how computational systems affect the real world and get more information directly from doctors, surveys and an interview were conducted. The following is a timeline:

**Table 1** Timeline

Event	Period
First Form	2 <sup>nd</sup> to 10 <sup>th</sup> May

Second Form	12 <sup>th</sup> to 25 <sup>th</sup> May
Interview	22 <sup>nd</sup> May

### 1. First Form

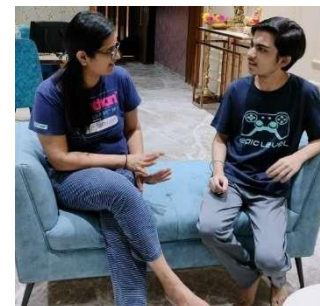
A form was made on the website JotForm containing 11 questions with a welcome and a thank you page. Some of the questions were general, like whether they are currently practicing medicine, and their medical field of expertise, while others were more related to the topic, such as, if they have any concerns regarding the current computational modeling and simulation technology, or how would it change in the future. The form was sent out to doctors and medical professionals. It got 11 responses in total and valuable feedback. There was a discrepancy in the responses. On further inquiry, it was found that the questions were more subjective, for which most doctors don't have the time to fill them out. Also, many doctors faced problems with the website, so they were unable to submit. The link for viewing and/or filling the form is <https://form.jotform.com/221212911624040>. The link for the responses is <https://www.jotform.com/tables/221212911624040>.

### 2. Second Form

Based on the feedback received, a second more objective form was made on Google Forms. It contained 16 questions and garnered 13 valuable responses. Most of the questions were MCQs, so doctors could easily fill them out. Charts were made (*refer to Discussion*) and trends were noted (*refer to Results*). The link for viewing and/or filling the form is <https://forms.gle/v5X6fq3grdFBuUcb6>. The link for the responses is <https://rb.gy/nxazcv>.

### 3. Interview

To get more in-depth information directly from the expert, an interview was conducted. The interviewee, Dr. Omshree Shetty, took out time from her busy schedule to aid this research. She has done her Ph.D. in cancer biology from Tata Memorial Hospital and her Post Doc from ICMR NIRRH. She is currently working with Tata Memorial Hospital (which is affiliated with the Homi Bhabha National Institute) as an Assistant Professor and Scientific Officer in Molecular Pathology.



**Fig. 1** Interview in progress

The questions asked were about the effectiveness and problems with computational modeling and simulation and its future potential. The answers received were extremely detailed and useful. Computational modeling and simulation have led to the development of robotic surgeries, in which doctors just have to press a few keys and the machine executes the task. They can carry out critical or delicate surgeries and increase the success rate by ruling out human error. Nevertheless, they even have a few disadvantages; unaffordability, inaccessibility, skills required, etc. In the future, as the number of people becoming aware of this technology increases it is bound to spread and develop further, leading to a reduction in cost, thus the rural areas will also have access to it. The link for the audio recording of the interview is - <https://rb.gy/bhudj7>.



### RESULT

The forms and the interview showed how computational modeling and simulation are currently used and trends regarding their future. It is being used to train doctors and practice surgery before performing it on humans. Nearly all the doctors believe it is mostly used in surgeries as compared to other medical fields. Also, our country is not at all behind the world in this field; even India possesses the same technology as others. Computational modeling and simulation have also reduced the burden on doctors by aiding them in complex procedures.

Where is modelling and simulation most used?  
 13 responses

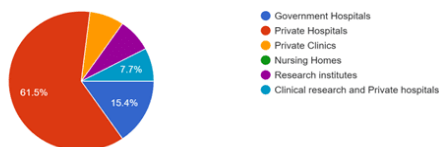


Fig. 2

Which type of model do you most use for surgery?  
 13 responses

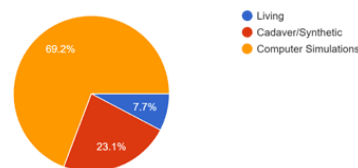


Fig. 3

Which type of model do you prefer?  
 13 responses

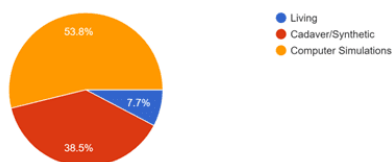


Fig. 4

Do computational simulations reduce complications in surgery?  
 13 responses

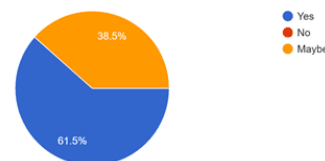


Fig. 5

### DISCUSSION

Fig. 2 shows that most doctors think that modeling and simulation are most used in Private Hospitals. According to Fig. 3, 7 out of 10 doctors use computer simulations for surgery while 1 out of 4 use cadavers. On the other hand, Fig. 4 depicts that 1 out of 2 doctors prefer computer simulations, while 2 out of 5 doctors prefer cadavers. As per Fig. 5, none of the doctors believe that computer simulations do not reduce complications in surgery. Fig. 6 and 7 show what doctors believe to be the major advantages and disadvantages of computer simulations respectively.

What are the major advantages of computational simulations? Tick all that apply  
 13 responses

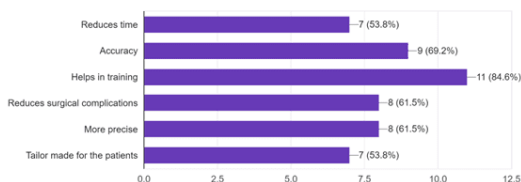


Fig. 6

What are the major disadvantages of computational simulations? Tick all that apply  
 13 responses

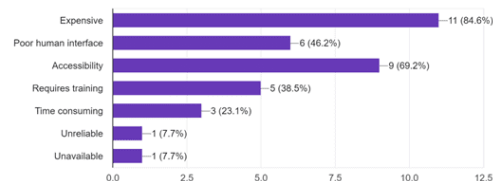


Fig. 7



### CONCLUSION

In conclusion, the scope of computational modeling and simulation in the future is endless. From practicing surgeries on living animals to identifying various blood vessels in cadavers to operating using computer simulations, medicine certainly has evolved a lot in the past years. Computational modeling and simulation can be the next major revolution in medicine. From gene editing to 3D printing body parts, we exist in a very interesting period in medicine. It is yet to be seen what wonders await us in the future. But one thing is for sure, the co-existence of humans and machines. While computational modeling and simulation can perform miracles, doing so without a human mind behind it is certainly impossible. Machines can never replace doctors, though technology can make life much easier for them while saving more patient lives at the same time. We could use machines for what they do best – simplify complex procedures and help conclude humanity's medical problems.

### Acknowledgments

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### CAREER SECURITY FOR INDIAN SPORTSPERSONS

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#### Abstract

'If you study you will live like a king, if you play sports you will destroy your life.' A famous quote once said, which has destroyed many dreams. Sports has evolved so much and has changed the way we perceive life. The significance of sports is increasing in our country day by day. Sports are meant for the overall development of a person and keeps us healthy. Our athletes/ sportspersons are making us prouder on an international level. Even though what are we providing to our real heroes, that is the question we need to answer. This research paper highlights how a lack of career security in a sports person's life discourages other people from pursuing sports as a career. It shows how that in India, athletes do not get the due that they deserve after toiling hard and have sacrificed so much, to pursue their careers and what injustice is caused to them when they don't have proper security for their career.

**Keywords:** pensions, insurance, sustainable standard of living, indiasports, Career security in sports.

#### INTRODUCTION

Sports are an important aspect of the overall development of a person. Sports should be given much more importance than it actually is given in India. More people should be encouraged to play sports and pursue careers in those areas. But the reason why this is discouraged by majority of our country is simply because of lack of career security provided to these athletes. Along with many other reasons such as short career span, lower pay compared to normal jobs, etc. But our main focus in this paper is talk about our country's career security for their athletes.

#### THEORY

In India, there is a huge lack of career security when pursuing a career in the sports field. The GOI is not spending enough money on sports infrastructure, equipment, facilities, etc. This limits our athletes to have world class training as the facilities available fall short as compared to other countries. The GOI needs to focus on sports other than cricket to ensure the overall growth of sports in our country than just ne or two. They need to provide insurances and pension schemes, which acts as a bonus for anyone who wants to pursue sports as a career. This lack of providing pensions good enough to obtain a sustainable standard of living and good enough insurance to look after the families of the athletes, does not promise a good career security for our Indian athletes. The high level of political influence in our country along with high level of corruption in our country also influences the career security of our athletes.





### CAREER SECURITY OF INDIAN CRICKETERS VS. CAREER SECURITY OF OTHER INDIAN ATHLETES

In our country, the sport of cricket is held in high esteem. Cricket is given lot of respect while other sports aren't given as much importance. While do we have leagues such as Indian Super League (which is for football) and Pro Kabaddi League (which is for kabaddi), they do not match to the love and support that the Indian Premiere League receives (which is for cricket). In our country there is fierce competition due to the high population. May it be for any sport. Even cricket. Due to this fierce competition young athletes tend to give up and lose hope on pursuing their dreams. While this does happen in cricket as well, it does not have that huge of an impact as compared to all of our other sports. It is the GOI's job to take care of and nurture these athletes in such a way that they never give up on their dreams, be it cricket or any other sport. It is our fault too as an audience, as we choose to watch sports such as cricket and do not bother supporting other sports. This results other leagues earning less money, which causes them to provide less career security to their athletes. As an audience it is our job to explore and diversify our choices and we should watch other tournaments other than IPL, if we want the future of sports in our country to shine brightly and give athletes a ray of hope to consider pursuing sports as a viable career option. This does not give justice to all the sports equally. It is not fair to give high number of advantages to one type of athlete and not give the same number of advantages to an athlete of another sport, even if that athlete is more talented than a cricketer. The BCCI is the richest cricket governing board in the world and earned Rs. 1522.01 crores in just 1 financial year of 2020-21. They use this money to provide hefty pensions to their players and also provide them with a good enough pension for their retirement. Whereas, associations such as, Badminton association of India, India Boxing Federation and Indian Golf Union do not provide their players with insurances or pensions required to enjoy a sustainable standard of living. Sports such as hockey, badminton, boxing are all played in Olympics, Asian games, Common Wealth games and Para-olympic games. Whereas, cricket is not played in these tournaments. A gold medalist in Olympics is paid a monthly pension of Rs. 20000, which is the maximum pension they can receive for this level of play. Silver or bronze medalist in Asian and commonwealth games receive a monthly pension of Rs. 12000 when they retire. Which is the minimum pension they receive for this level of play. The other rates of pension in between differ according to level of play. Whereas a first class average cricketer receives a monthly pension of Rs. 40000 from the BCCI when they retire. The insurance provided to cricketers is far higher than the insurance provided athletes in any other sports field. In the event of any injury, a cricketer can enjoy a good standard of living and will still be able to provide for his/her family, whereas an injury of an athlete in any other sports field can be career ending due to lack of proper insurance.

### RESULTS

With the help of the experiment conducted above it is very clear how there is a huge bias towards cricket in this country. Cricketers have a high career security, whereas athletes who pursue careers in different sports have very little or no career security. Lack of career security for sports other than cricket can increase the poverty rate in the country as not many people get the opportunity to pursue sports such as cricket due to the expensive coaching and expensive equipment required to play the sport. People tend to pursue cheaper sports, but without proper security it can just lead to the downfall of a country.



### DISCUSSIONS

#### Pensions of international level athletes

S.No	Category of meritorious sportspersons	Rate of Monthly Pension
1	Medallists at the Olympic Games / Para Olympic Games	Rs. 20000
2	Gold medallists at the World Cup/World Championship* in Olympic and Asian Games disciplines	Rs.16000
3	Silver or Bronze medallists at the World Cup in Olympic and Asian Games disciplines	Rs.14000
4	Gold medallists of the Asian/Commonwealth Games/Para Asian Games	Rs.14000
5	Silver or Bronze medallists of the Asian/Commonwealth Games/ Para Asian Games	Rs.12000

This table shows the pension rate which is received by sports persons for competing in all of the above championships. Even though the achievements of these players is remarkable and is so high, the maximum pension that they receive is not high enough for them to run their house and take care of their family. Such sheer hard work and dedication for the sport is all thrown away if they don't get what they deserve. All sports other than cricket come under this section. Sports such as boxing, badminton, swimming, wrestling, football, etc. are played in these championships.

#### Pensions of Professional Indian Cricketers

Sr. No	Category / No. of matches played	One Time Benefit	No. of Beneficiaries	Total Amount
1	100 or more Test matches	15,000,000.00	11	165,000,000.00
2	Between 75 and 100 Test matches	10,000,000.00	7	70,000,000.00
3	Between 50 and 74 Test matches	7,500,000.00	13	97,500,000.00
4	Between 25 and 49 Test matches	6,000,000.00	27	162,000,000.00
5	Between 10 and 24 Test matches	5,000,000.00	37	185,000,000.00
6	Between 1 and 9 Test matches	3,500,000.00	37	129,500,000.00
7	100 or more First class matches at the end of 2003-04 season	3,000,000.00	24	72,000,000.00
8	Between 75 and 99 First class matches at the end of 2003-04 season	2,500,000.00	81	202,500,000.00



This table shows the beneficiaries received by the Indian cricketers, compared to the athletes playing the other sports. These show the pensions of professional athletes, but in order to receive these benefits, certain conditions have to be met, which has been listed in the table. There is a huge difference in terms of the amount paid to them. For the same amount of effort, determination and dedication, there should be an equal number of pensions given to both athletes of different categories. But the cricketers are still paid far more than the other athletes and is very visible from the tables. The cricketers get more benefits and are able to provide more for their family. This is the state of sportspersons in our country who choose to pursue a sport other than cricket. In short, the comparison of these two tables summarizes why a person would not consider pursuing a career in a sport other than. If there are not getting good returns for their efforts, then why would one bother choosing such a field and put the wellbeing of their family at stake? Even football being a popular sport, is not considered as a career option due to the lack of career security. Parents would obviously discourage their children from pursuing such unrealistic dreams and would encourage them to pursue normal jobs instead.

### CONCLUSION

In conclusion, I would like to state that providing security to these sports person is a very important task that our government needs to undertake, as it is their job to encourage the youth to pursue sports as a career option and make them believe that it is possible to achieve a successful career in the sports industry. They can encourage the youth to do so by starting good schemes of pensions and insurance to players who are playing sports other than cricket. If the government starts taking this matter more seriously, it would benefit them in the long run and would ensure a strong economic growth of our country.

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## TOPOLOGICAL CONFIGURATIONS AND OPTIMIZATION TO STRENGTHEN UNDERWATER NETWORKS

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### Abstract

The turmoil generated by a disaster, creates a barrier between the epicentre and the evacuation team, which is a challenge that needs to be overcome. Underwater communication can be established proficiently by several methods, a few of which are evaluated in this paper. In my opinion, in comparison to Radio frequency or acoustics, light fidelity implemented as a communication channel is a more reliable way of transmission.

Keywords: *Underwater communication, Li-Fi, UWSN, Acoustics*

### Introduction:

Taking into consideration the nuances of what communication channels have to offer and including the mechanism of their operation, is pivotal in order to narrow down to one's most proficient for a fortified and promising usage supplementary to disaster management. These frequencies enable determining the amount of a disaster befallen at a particular destination. The impairment caused can be derived by the computational formats created and a protocol can be elected contingent on the intensity of the tragedy. Heterogenous clustering protocols are usually used which will exceedingly benefit areas that are prone to these calamities and places where an intrusion of an undesired entity is detected, as utilising this efficiently can reduce destruction whilst focusing on the main idea of what disaster management is all about.

Electromagnetic waves, that will certainly be affected by the conducting nature of the seawater as high frequency EM signals cannot penetrate and propagate deep in underwater environments. Optical waves cannot do much help in cases of calamities occurring far away from the source as they are absorbed by seawater, substantially optical transmission or light fidelity can prove as a remarkable alternative.

Acoustic data techniques, which prove to be most reliable out of the three due to its impressive ability to send data to different positions. Although physical reasons have led to the prevention of this and therefore acoustic spectrum is temporally and spatially underutilized in underwater environment.

i.e. The refractive index of water and the reflection have created a double-sided effect. The sending and receiving has led to an observance of the dopplers effect creating time-varying multipath. Subsequently, speed of sound is only 1500m/s and it has a limited reach or bandwidth.

Theory:

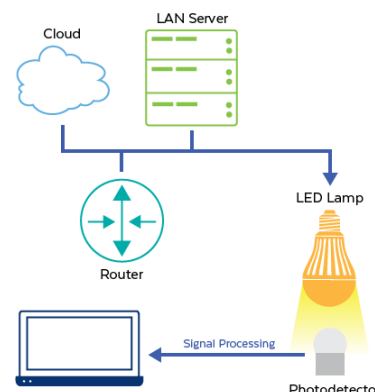
1. Light-fidelity (Li-fi)



Light fidelity is a mechanism that deals with bidirectional communication, transfer through light waves on the electromagnetic spectrum and LED and in contrast to acoustic waves, proves to be proficiently eligible in order to alert the evacuation centres before the occurrence of a disaster. Bilaterally transferring intel through luminescence and proving help to disintegrate the barrier of finite bandwidth. It also relieves congestion in the radio spectrum, being Complementary to wi-fi but can work.

The use of LED stipulates that less energy is being used and it should be kept in mind that while the light is visible, the data is not. The photodetector receives a signal and sends it to sink which is then exported to the cloud and is available in any computational formats.

The intel is carried by light in bits, this mode needs the installation of a receiver and a transmitter, where at the receiver, a photo diode is employed to collect photons and convert them into electric current or signals. The photo detector is usually placed near the surface of the sea. Air bubbles, salinity, and thermal fluctuations in the water causes underwater optical turbulence (UOT) affecting the communication system. The image shows how the affected areas have an impact on the transmitter and it sends signals to the receivers which is then stored in the cloud and delivered to the required portals.



### Results:

	Organic Particles	Contribution towards scattering and absorption
1	Viruses	Large numbers, however very small impact. can be efficient back scatters at least at blue wavelengths in very clear waters
2	Colloids	attributed to dissolved matter
3	Bacteria	blue spectral ranges in clear oceanic waters
4	Organic detritus	Poor scatters and absorbers except at blue wavelengths
5	Large particles including zooplanktons	Strongly diffuse the light beam
6	Phytoplankton	Widely present in most oceanic waters

Contingent to how much each of the organic and inorganic particles contribute in fluctuating the wavelength values, the chlorophyll levels in each type of water is determined and graphs are



plotted which is an easily recognisable quantitative way to know if one needs to implement ideas to alleviate the spread of certain particles to provide for the bestreach of signal.

The scattering coefficient for the bio-optical model is a function of wavelength and chlorophyll concentration is given by a formula. attenuation coefficient varies with wavelength ( $\lambda$ ) for both Clear Ocean and coastal area. It is clear that the total attenuation is the sum of total absorption and total scattering.

Lat factor taken into consideration is the attenuation vs wavelength graph where in the attenuation is said to be controlled by choosing a colour range with respect to wavelength. violet-blue-cyan-green light are the one's with the lowest wavelength and are suitable for effective transmission. Although violet light is not in the market. So blue-Cyan-Green spectral range is chosen as an ideal way of transmitting light.

If Li-Fi technology replaces Wi-Fi and other broad band networks, daily life would change dramatically in every way. The major problem it faces is data handoff across multiple access points and data upload at a rapid rate. There are certain limitations and challenges with Li-Fi technology one of the main being that there has to be presence of direct light for its services to be used. There shouldn't be any barrier in the signals range and even the sun's rays can impact the communication. Since Li-Fi operates at very high frequency (400-800 THz), it is suitable only for point to point communication. Another point to highlight here is that since it needs 24 hours of uninterrupted internet supply, whatever light source is used, it dissipates huge amount of energy.

### CONCLUSION:

Li-Fi will have co-exist with many blockages so a way or model of tracking these blockages is desired. The other potential ways of improvement to the spectrum can be by deep digging in the areas regarding nonlinear sound propagation of acoustic signals which can be more beneficial for designing future communication techniques. The future identified research areas can include cognitive networks area and underwater spectrum for their efficient use. Although the subaquatic wildlife should be taken into considerations before an instalment of any equipment that can lead to the enhancement in the reliability of the spectrum. The near future does surely promise the implementation of these techniques. Li-Fi balloons that is LiBnet can be used hand in hand with the bio optical model for a more fortified usage during disasters

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## WAVE OF ADVANCEMENT CAUSED DUE TO TECHNOLOGY

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### Abstract

Present day technology has caused massive improvements in multiple fields of works including the medical field. This research paper mainly concentrates on simulations, modelling and computational systems, their working models. The paper also compares the three technologies on the basis of their uses in the medical field. At last we will have a look at the conclusion obtained from the information presented in the paper.

Keywords: simulations, computational modelling, computational techniques, diagnosis, virtualpatients

### Introduction

In the past few years the field of medicine has drastically changed because of evolving technology. Amongst all the rising technologies this paper mainly concentrates on simulations, modelling and computational systems. As for medicine it has many subfields under it but this research paper mainly concentrates on the uses of these three technologies in the field of academics, diagnosis, and drug production.

### Simulations and Computational Modeling

Simulations is a technological advancement which allows users to imitate any situation or surrounding. Now a day there are multiple software's and systems which produce simulations of different scenarios, Computational modeling is the use of computers to simulate and study complex systems using mathematics, physics and computer science. Computational modelling and simulations often work together.

### Computational systems

Computational system refers to the computer system which we all use on a regular basis. A computer system has three main components: hardware, software and central processing unit(CPU). Hardware includes input and output devices example: keyboard, mouse, etc. Software is a program which helps the user carry out certain tasks or operations.

### Use of these technologies in academics

Simulations and modelling can play a really important role in academics. As for theoretical knowledge simulations and modelling can be used to present certain scenarios which are written in books. The basic systems within the body, like circulatory system and digestive system can be presented using model and simulation. By using computational modelling and simulation the flow of blood cells within the body can be easily depicted in the form of a simulation. one of the other most important uses of simulations and modelling is in practical knowledge. Specimen observation and dissection is a really important part of practical knowledge in medicine but in

the past few years the availability on human specimens decreased[1], hence Models and simulations can be used to build a fake human specimen for the anatomy to be performed on. one of the main components of such type of learning is VR(Virtual reality).

Fig.2 virtual patient graph one (knowledge)

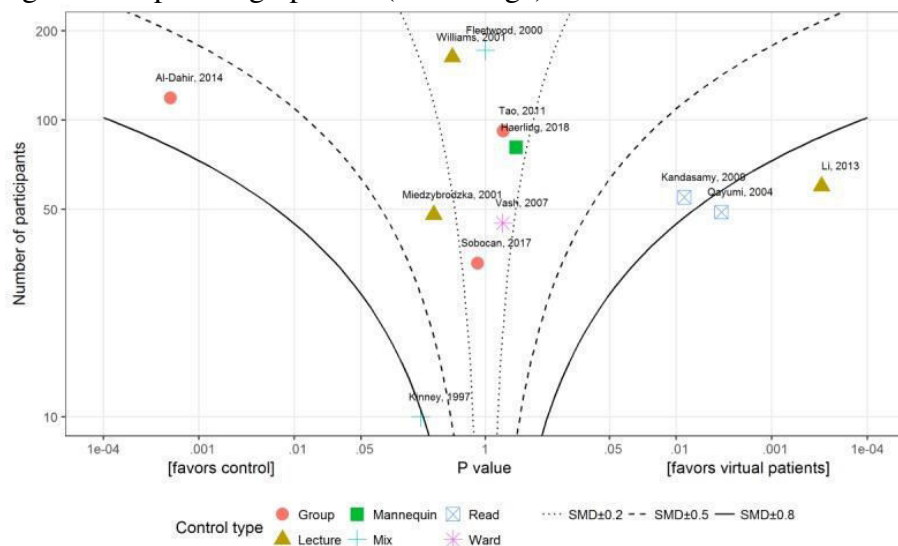
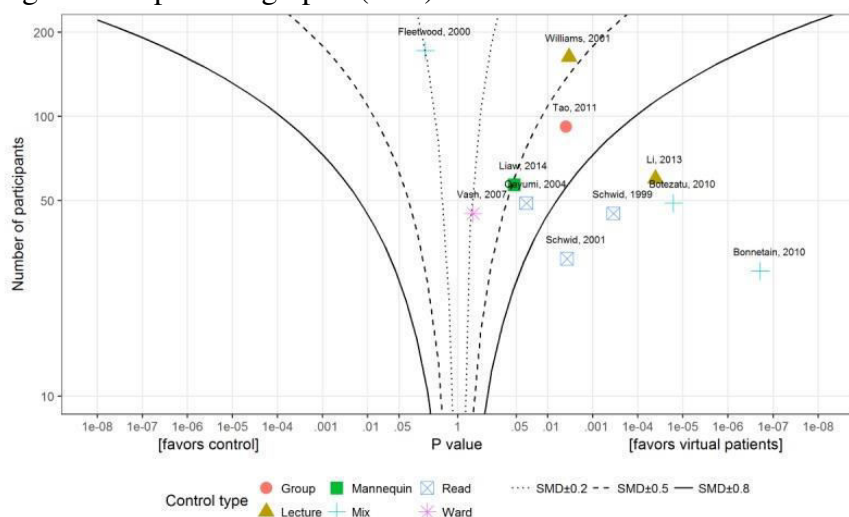


Image credit: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6632099/>

Fig.3 virtual patients graph 2(skill)



The graphs presented above are from a investigative research paper and the graphs are from the results of a survey which was conducted among medical students who were exposed to both the traditional method of learning(which is real life human specimen) and also simulation and modelling(which is VR patients). And the conclusion of the gives a suggestion that compared to traditional education virtual patients tend to be effective, with respect to development of skill as well as knowledge.[1]Computer systems can be used to store student data or exam results using some application software like access and excel. some output devices like multimedia projections can be used by students and teachers to given presentations.



### Use in diagnosis

Models and simulations can be used in diagnosis to help doctors or surgeons to decide what action should be carried out next. CRIMSON is a open source software that has been in use since 2015[4]. This software uses simulations to depict the patients flow of blood. The simulation can be created from data collected from MRI scans. The same data can be used to build a model of the circulatory system of the patient. The model and simulation help the surgeons to decide and carry out the surgery. Computer systems also have multiple uses in the field of diagnosis. There many input and output devices used in medicine: X-ray machine, CT scan machine, MRI scan machine, ultrasonography etc. Apart from these devices one of the other important uses of computer systems in the use of expert system or computer assisted decision making(CMD).

Fig.4 expert system or CMD

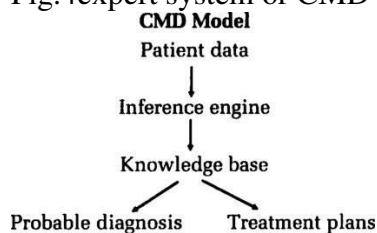


Image credit : (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6257447/>)

This system can be used in diagnosis in the following way. First the user can put the symptom in the user interface and submit it as the patient data. The inference engine refers to the knowledge base and identifies the disease with the same symptoms and the possible treatment or diagnosis for the disease is provided by the system.

### Use in drug production

Drug production is an extremely time-consuming process as the drug produced must be tested multiple times to check if it fulfils its cause but with the use of these three technologies the time consumed to produce these drugs can be reduced. As mentioned in the above two subfields' simulations and models can be used to depict the region which will be affected by the drug. Using models and simulations the effectiveness of the drug can be visualised before being tested. The same CMD or expert system mentioned in the above session can be used in production of drug or suggestion of a drug. If the symptoms of a disease is entered the expert system refers to the inference engine which looks through the knowledge base and suggests which drug can be given as a possible cure for the disease.

### Conclusion

The research work presented shows the advancement in medical field cause due to these three technologies. The process which were considered difficult and time consuming in the tradition methods can be done more productively and easily because of digital advancement.

### Acknowledgements

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## IMPACT OF LEADERSHIP ON BUSINESS MANAGEMENT

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### Abstract

The main objective of the research was to find out the impact of different leadership styles on business management and their overall performance. The necessary roles required for making of a good leader were discussed at the beginning of the research. It was clear that numerous leadership styles have a distinctive effect on the work environment in which the employees work in, and the point of view of the delegates. It was concluded that leadership behaviors have a profound effect on the management staff as well as the future and growth of the company.

### Introduction

‘Leadership is influence.’ This research is based on the personal qualities of a leader i.e.- his or her interpersonal skills, the leader’s ability to foster an appropriate culture and to manage talent. These qualities can later be used to rate a leader. Furthermore, the research specified the effect of leadership styles on the productivity and effectiveness of the employees. It was found out that leadership styles used by various enterprisers and their decision could make a change in the productiveness of the organization.

### Theory

Leadership does not have a comprehensive meaning, but it can be advanced from various outlooks. There are different leaders and each type of leadership beholds varied qualities and capacities. The five roles of a good leaders are Motivator, The Mentor/Navigator, Good Learner with Better Communicator.

### Rating Leadership Qualities

For starting a business, we need leaders to implement policies and motivation for the employees. You can’t be its only leader. The Leadership Qualities Assessment index lists characteristics in two broad domains: the individual domain, looking at the personal qualities of a leader, his or her strategic prowess, execution proficiency, interpersonal skills, and leadership “brand“ or style; the organizational domain, covering the leader’s ability to nurture an appropriate culture, manage talent, inspire accountability, communicate information, and create work processes that align with the company’s strategy. If an organization with 100 people, it’s 10. If you have an organization with 1,000, it’s 30 to 3. These are some models of leadership styles includes Situational, Transactional, Transformational Authentic leadership, Democratic leadership. This style is also called TEAM( Total Efforts of all members), Autocratic Leadership style, Entrepreneurial style, Charismatic Style.



### Effects of leadership styles

Leadership has an overwhelming effect on the respective employees and other staff members. Some benefits of leadership styles on employees include Higher quality and safety, Better work/life balance, Excellent customer service: Growing profitability and Appreciation.

### Experimental

Effective leadership is one of the greatest fundamentals to building great organizational cultures. A leader can be anyone who has influence or authority, regardless of title, and leaders set the tone for organizational culture.

Leaders can reinforce values while simultaneously holding people accountable. This influence over others can be either positive or negative based on the leadership style and execution of strategy, but both effective and ineffective leadership will influence and build organizational culture in the workplace.

### 1.Introduction to the company

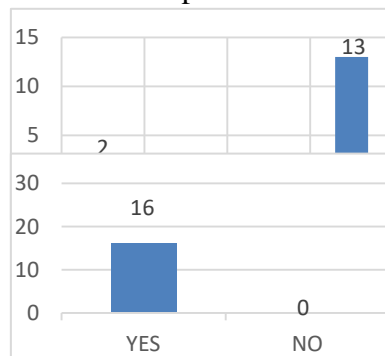
Techno soft is a global technology services company offering broad based Engineering and IT services using a variety of client -partnership models for delivery. Technosoft’s client base spans various industry verticals including Heavy Engineering, Industrial Equipment ,Machinery & Robotics ,Off -Highway Equipment ,Transportation, Automative ,Medical devices and customer electronic products. The company’s client base is primarily centered in the US,Canada,UK and Germany .Technosoft’ scenter of excellence for engineering is located in Mumbai ,India.

Technosoft Engineering is a wholly-owned subsidiary of TechnosoftGroup ,a publicly -traded ,45 -year old manufacturing and engineering conglomerate. Technosoft derives its core engineering expertise and financial strength from Technosoft group and leverages its network in over 20 countries.

### 2.Result

Analysis of the survey questionnaire is dealt with leadership behavior and leadership styles .There are 400 employees working at Technosoft Engineering. out of which 16 male population with age group between 35-45 yrs.responded to the survey questionnaire.

Out of 16 respondents the number of respondents who have been working in Technosoft for less

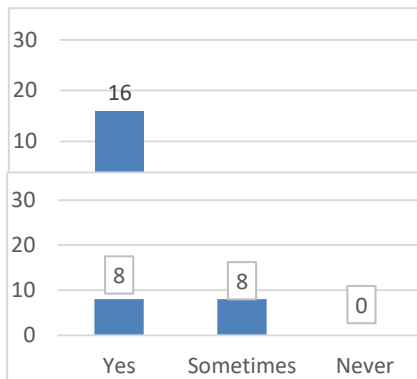


than one year is 2.One of the respondents have been working for the company for more than 2 year .Finally 13 of therespondents has been working for more than three.

#### Figure1 :Work in Technosoft Engineering

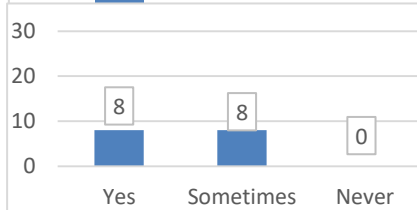
All 16 respondents were doing exactly the task they were choosenfor .This shows that more respondents work for the company’s interest .This is shown in the

#### Figure 2 : Doing the task



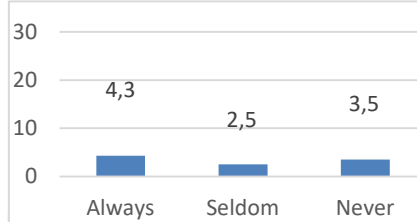
16 respondents stated that they are always encouraged to use the standard procedures. This means that the company has policy to encourage the use of standard procedures.

**Figure 3 :Standard Procedures**



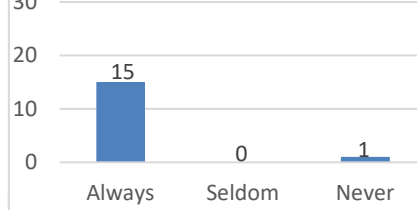
There are 25 respondents out of 29 who said that they are satisfied with the settlements of conflicts in the company. Three respondents replied that sometimes and there was one who was not satisfied with settlements of conflicts in the Company.

**Figure 4 :Settlements of conflicts**



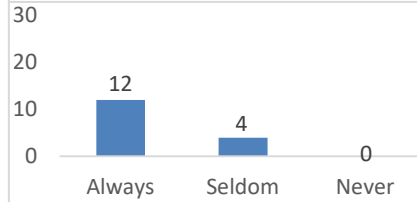
15 Respondents out of 16 are pushed for improved quality. One of them said that this happens seldom This means that management in the company is well organized.

**Figure 5 :Pushed for improved Quality**



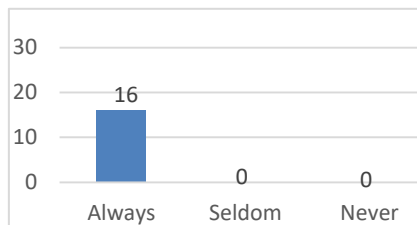
There are 15 respondents out of 16 who said that they are well motivated towards accomplishing the task whereas one said that there is lack of motivation. This means that the employees are highly motivated towards their tasks in the company.

**Figure 6 :Motivated accomplishing task**



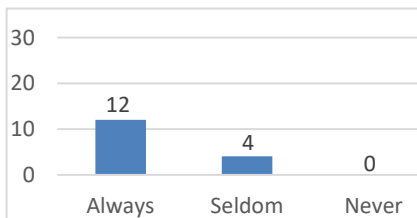
12 respondents out of 16 said that they always have freedom of action whereas 4 of them replied that they seldom have freedom of action .This shows that most of the people in the company have freedom of action regarding their work issues .

**Figure 7: Freedom of action**

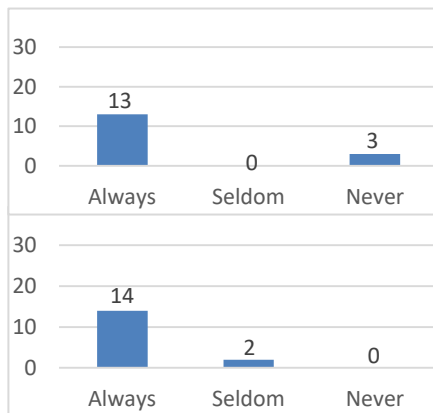


There are 16 respondents who said that they get support for building a team, This means that there are good team leaders and the managers in the company to support their teams

**Figure 8 :Support for team building**

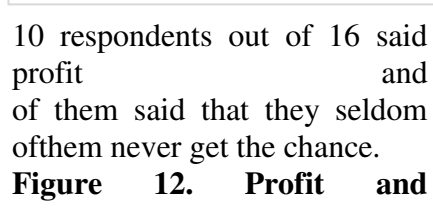


12 respondents out of 16 said that they have strong backup to beat the previous targets whereas 4 of them said that they seldom have this chance .This shows that company is working hard to offer strong support as shown in **Figure 9. Strong backup for beating previous targets.**



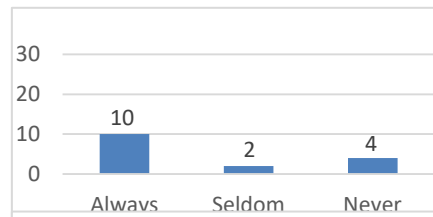
13 respondents out of 16 said that they can work under pressure for completing assignments whereas 3 of them said that they can't.

**Figure 10.** work under pressure for completing assignments



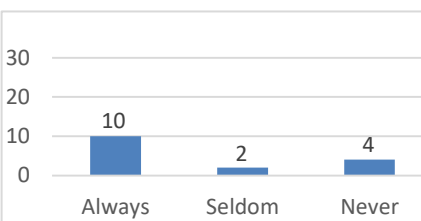
14 respondents out of 16 said that they delegates work to subordinates and monitors achievements for results . whereas 2 of them said that they seldom have this chance .

**Figure 11.** Delegates and monitoring of work



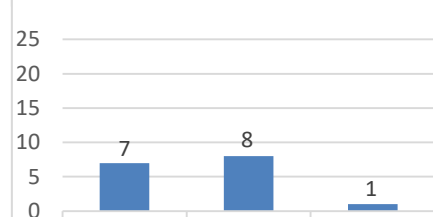
10 respondents out of 16 said profit and of them said that they seldom of them never get the chance.

**Figure 12.** Profit and



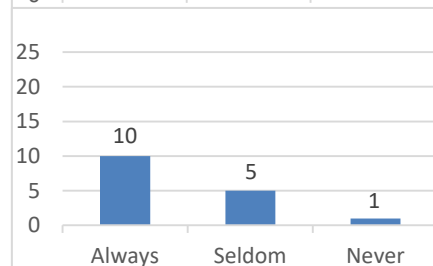
that they always work for profitabilitywhereastwo have this chance and 4

**profitability**



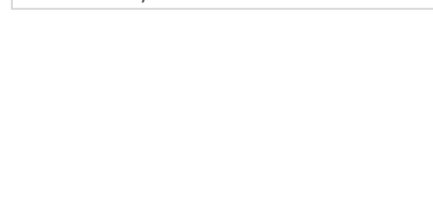
All 16 respondents keeps the customer satisfaction upmost in mind and taking prompt actions on customer feedbacks and takes action This means that there are good team leaders and the managers in the company .

**Figure 13: Customer Satisfaction**



7 out 16 respondents said that they get rewards for the performance. 8 said that they seldom got rewards. One of them said that they do not get rewards at all as shown in

**Figure 14.** Rewards for performances



10 out of 16 respondents were satisfied with the CEO and said that they got help from the CEO in the best possible way towards the success.Five of them said that they seldom got help and one of them stated they never got help .

**Figure 15.** CEO efforts towards success



### DISCUSSION

The main aim of the research is to find the impact of leadership behavior on a firm's business growth. The research was done to study how the firm grows towards success and achieves targets with the help of leadership behaviors and different types of leadership behaviors were discussed. Technosoft Engineering is one of the fastest growing companies in the service sector area in the region. According to the Analysis of interview with Business Head the business has been growing by enriching competencies and tapping new opportunities. In addition to that, growth was well planned with sales and execution drives. They give their employees opportunity for on job learning and explore new domains. Furthermore, they help them grow in career and work in dynamic team environment. They also focus in making smart (Specific, Measurable, Attainable, Relevant, Time-based) targets and appropriately facilitating them with needful support. Last but not the least, a clear vision with roadmap for incremental growth guides team to perform and give steady development.

### CONCLUSION

After the survey with the employees, it has been concluded that the democratic and transactional leadership behavior type which is a reason for the growth and success of the company in a short period of time. Mostly employees were satisfied with the company heads and leaders and their actions towards the management and employees; this is one of the main reasons for the growth and performance of Technosoft Engineering.

### Acknowledgements

I would like to convey my sincere thanks to my Project In-charge Mrs. Clarine for her valuable suggestions and feedback throughout my thesis process. It would not have been possible to complete this study without her support.

I would also like to thank the officials of Technosoft Engineering, especially Business Head Mr. Rajiv Sinha and Senior Project Manager Mr. Anil Padvi for helping me in providing all the necessary information related to the research.

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### COMPUTATION IMAGING IN CELL BIOLOGY

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#### Abstract

Image analysis converts digital pictures into measures that indicate the condition of each individual cell in a study. Because manually verifying picture quality in high-throughput tests is nearly impossible, automated solutions are required. The scientific community would benefit from exchanging image-based profiling methodologies and software code.

#### INTRODUCTION

Computational imaging is the technique of creating pictures indirectly from data using algorithms that need a lot of processing power. Information that doesn't look like a picture, can be decoded using computational imaging; using algorithms that understand how that system works, it can interpret what the measurements mean and decode them into a picture. By addressing obstacles in the computer realm, computational imaging systems enable system designers to overcome some hardware limits of optics and sensors (resolution, noise, etc.).

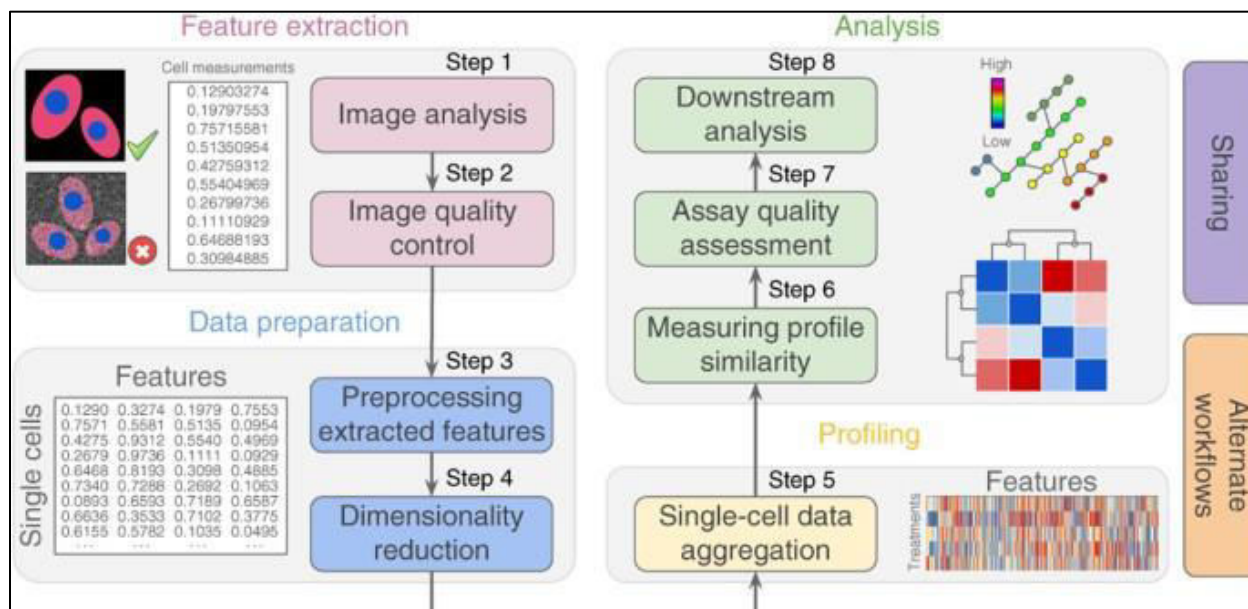
Recent advancements in automated microscopy and image processing have made it possible to evaluate a large number of treatment scenarios in a single day, allowing for the systematic examination of specific cell morphologies.

Image-based profiling, also known as morphological profiling, uses images as unbiased sources of quantitative information regarding cell state. Various treatment conditions can be compared to uncover physiologically meaningful commonalities for grouping samples or identifying matches or autocorrelations by characterizing a population of cells as a rich set of data, referred to as a 'morphological profile.'

Images are transformed into quantitative data in eight phases to support experimental results –

- 1: Image analysis.*
- 2: Controlling the image quality.*
- 3: Preprocessing extracted features*
- 4: Reduce dimensionality*
- 5: aggregation of single-cell data*
- 6: Measuring profile similarity*
- 7: Evaluate the assay's quality*
- 8: downstream analysis.*





### 1: Image analysis

Image analysis converts digital pictures into measures that indicate the condition of each individual cell in a study.

The most prevalent methods for constructing correction functions from images are prospective and retrospective, although they differ in their assumptions and necessitate careful calibration at the time of acquisition. These methods frequently rely on assumptions that are often incorrect in practice, such as smoothing, surface fitting, or energy-minimization models.

Illumination correction is an important step for high-throughput quantitative profiling; the strategy of choice in most laboratories is a retrospective multi-image correction function.

The experimentalist chooses an appropriate algorithm and manually optimizes parameters on the basis of visual inspection of segmentation results. A priori knowledge (i.e., a 'model') is needed, such as the objects' expected size and shape. Machine learning can perform better on difficult task such as highly variable cell types or tissues. It does not require as much computational expertise but requires manual labeling of training pixels for each experimental setup. The phenotypic characteristics of each cell are measured in a step called feature extraction, which provides the raw data for profiling. Cell profiling involves computing as many features as possible to select robust, concise, and biologically meaningful features to increase the chances of detecting changes in the molecular states of cells. The most common practice is to measure hundreds or even thousands of features of many varieties; the details are typically described in software's documentation.

### 2: Controlling the image quality.

As manually verifying image quality in high-throughput studies is nearly difficult, automated solutions are required to objectively flag or eliminate artifact-affected images and cells. These strategies aim to reduce the chance of inaccurate values contaminating the data.



Artifacts such as poor autofocusing or saturated pixels can wreak on images (for example, debris or aggregations that are inappropriately bright). For quality control, picture intensity measurements are commonly utilized. Errors in sample preparation, imaging, image processing, or image segmentation can also result in outlier cells. Although meticulous approaches and processes are the best way to reduce errors, there are numerous strategies for finding outlier cells. Outlier detection entails using normal samples to train a model that can help detect outlier cells.

To prevent eliminating data points that represent cells and samples with intriguing characteristics, extreme vigilance is advised. Outlier-detection algorithms may wrongly assume normality or homogeneous populations in samples made up of distinct subpopulations of cells.

### 3: Preprocessing extracted features

Preparing retrieved cell characteristics for further analysis is a delicate process that can either improve the detection of interesting patterns or contaminate the data and lead to inaccurate conclusions.

Non-finite symbols (such as NaN and INF) indicating incomputable values may be produced using feature extraction tools. In general, it is preferable to utilize these symbols rather than assigning a numerical number that could be regarded as phenotypic. Missing values can be handled in three ways: by eliminating cells or features, or by using imputation. Multiwell plates are used in high-throughput tests, although they are prone to edge effects and gradient errors. Samples should be put in random locations on the plate layout to mitigate these positional effects. Other methods include 2D polynomial regression and running averages, both of which use local smoothing to correct spatial biases.

Batch effects are subsets of measurements that are the consequence of undesired technical fluctuation (for example, changes in laboratory conditions, sample manipulation, or instrument calibration), rather than a relevant biological signal. Batch effects are a significant barrier for high-throughput methods, and rectification is a necessary first step. It is advised that batch effects be identified by evaluating correlations among profiles (as outlined in 'Single-cell data aggregation'). Diagnostic measurements and plots can be used to assess the requirement for converting feature values. Visual identification of features that vary from symmetric distributions is possible with histograms, cumulative distribution curves, and quantile–quantile plots.

The Kolmogorov–Smirnov (KS) test and the Kullback–Leibler divergence are two analytical tests that can be utilised. These transformations are frequently used to obtain approximation normal distributions for features that haven't been given a normal distribution.

### 4: Reduce dimensionality

Given that morphological features produced for profiling are typically somewhat redundant, dimensionality reduction tries to filter less useful information and/or integrate similar features in the morphological profiles. The resulting compact representation is more tractable in terms of computing, and it also prevents overrepresentation of related features.

By removing certain features and retaining the rest in their original format, feature selection minimizes dimensionality. Finding associated characteristics or filtering on the basis of replicate correlation are two options. A mix of approaches, especially in conjunction with the replicate-correlation strategy, could be used. In profiling applications, selecting the traits that best



distinguish the treatments from the negative controls may be desired. Linear transformation looks for lower-dimensional data subspaces with the same information content as the original. The variance in successive orthogonal dimensions is maximized using this method. Transformations, unlike feature selection, can combine individual features, making the resulting features more powerful and information dense while also potentially limiting their interpretability. For discriminating small-molecule inhibitor effects, PCA has been found to outperform other dimensionality-reduction approaches, such as random-forest selection.

### 5: aggregation of single-cell data

Population-level (also known as image-level or well-level) representations are created by combining the measurements of individual cells into a single vector that summarizes the population's typical characteristics, allowing populations to be compared.

For constructing population-level profiles from all individual cell profiles in the sample, there are three easy and widely utilized procedures. In two separate investigations, the median profile was found to perform better than alternative profiling procedures, and it is the preferred choice in most of our facilities. Bootstrap estimators, which were previously utilized for phenotypic categorization, can be used to create other aggregation algorithms.

Ensemble averages of single-cell measurements are expected to reflect the major biological mechanism influenced by the treatment condition in most cell-profiling methods. Even within the same well, subpopulations of cells have been observed to have diverse morphologies. Data understanding and visualization can be aided by classifying populations of single cells based on their form.

### 6: Measuring profile similarity

The definition of a metric to compare treatments or experimental conditions is an important part of downstream analysis. The use of similarity metrics reveals links between morphological profiles.

Calculation of similarity metrics. The commonalities among a collection of treatment conditions can assist downstream analysis and allow for direct visualization of data structure with the use of a suitable metric.

Morphological profiling is the process of calculating a statistical estimate of the likelihood of two profiles having a relationship. Because they aggregate the lengths of feature variations independent of directionality, distance measurements are highly effective for quantifying the magnitude difference between profiles. Pearson's correlation, Spearman's rank correlation, Kendall's rank correlations, and cosine similarity are some of the statistics utilized in morphological profiling. The quality of selected characteristics determines how well distance and similarity measurements perform. When dimensionality increases, metrics' capacity to distinguish differences between vectors decreases. This is a problem with high-dimensional feature profiles. The metric you choose is also important since effective metrics take advantage of the structure of the features you have.

Multiple concentrations are routinely evaluated in chemical perturbation investigations. Researchers are looking for phenotypic similarities between drugs, even if such similarities happen at different concentrations. The NxN correlation matrix is generated between all pairs of



concentrations for a set of  $n$  doses for each component, and the greatest value is utilised as the dose-independent similarity score.

### 7: Evaluate the assay's quality

Assessing the validity of morphological profiling assays can be difficult: relying on a few positive controls is unreliable, but there are rarely a significant number of controls available, and no other ground truth sources. Every measured profile is made up of a mix of the signal linked to the perturbation and unwanted effects such as batch effects and biological noise. The use of a quantifiable indicator of whether the assay is better or worse as a result of particular design decisions is beneficial when tuning the sample-preparation technique, picking cell lines or incubation durations, and deciding among options within the computational pipeline.

Classification accuracy is a useful parameter for assessing the quality of a machine learning algorithm, but obtaining ground-truth annotations on a big scale is difficult. Human MCF7 breast cancer cells (in this case, distinct classes of compound 'mechanisms of action') are the only publicly available picture data set with a substantial number of class annotations. Clustering is a technique for determining the general structure of relationships among samples in a study. It's safer to use a null that includes pairwise correlations between treatments rather than a null that includes correlations between treatments and negative controls. To explain a predetermined fraction of variance, highly varied signals from different biological treatments should require additional components (for example, 99 percent).

### 8: downstream analysis

The process of understanding and evaluating trends in morphological profiles is known as downstream analysis. The parallels and linkages among the experimental conditions studied are the most essential readouts. The application of machine learning and visualization of associations can aid in the discovery of biologically significant structures and linkages among distinct treated samples. Most labs employ a combination of these techniques, with unsupervised clustering serving as a solid starting point for data exploration. Following that, the study's objectives have a big influence on the method mix.

Finding clusters is one of the most effective ways of extracting meaningful relationships from morphological profiles. Clustering algorithms can be used for identifying new associations among treatments as well as validating known connections and ruling out batch effects. Hierarchical clustering is computed by using a similarity matrix that contains the similarity values for all pairs of samples (described in 'Measuring profile similarity').

By employing a 2D (and sometimes 3D) map layout that approximates their placements in the feature space, data visualisations can highlight the distribution and grouping of high-dimensional data points. PCA, Isomap, t-distributed stochastic neighbor embedding (tSNE), and viSNE are some of the most used approaches. Plots are used to reveal correlations between samples and to uncover structures in data. Interactive plotting capabilities are provided by graphical tools like as Shiny, GGobi, iPlots in R, Bokeh in Python, and D3.js in JavaScript, the majority of which may also be deployed in server-client contexts for public dissemination. Supervised classification systems learn a rule from examples of data points that correspond to distinct classes of interest, and then compute the probability of each unknown data point falling into one of those classes.



### Tools

There are presently a plethora of software tools and libraries aimed at addressing the processes stated in this paper. CellProfiler<sup>24</sup> and EImage<sup>35</sup> are two open-source alternatives, while Columbus and MetaXpress are commercial options. Statistical software like as R, especially cytominer, which is tailored to morphological profiling, have shown to be particularly beneficial for single-cell data analysis. To process data using specialised methods, other programming languages such as Python, Matlab, and shell scripts might be employed.

As a result of efforts in several laboratories, the data-processing workflow and recommendations given in this study have evolved. The convolutional neural network (CNN), which learns to extract valuable features directly from raw pixel data, is currently the most relevant model for image analysis. Some of our labs are already experimenting with different workflows, such as the ones listed below. Deep autoencoders have been tested on high-content morphology data, indicating that they may have a higher performance for downstream analysis based on cluster homogeneity. Using entire images reduces single-cell resolution but has various advantages, including the elimination of the segmentation stage, which saves time and effort in manually tweaking segmentation and feature extraction algorithms.

### Conclusion

Computational imaging is an effective analytical tool for improving clinical decision-making in customized precision medicine.

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### IMPACT OF LEADERSHIP IN BUSINESSES

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#### Abstract

In the workplace, managers (leaders) adopt different mannerisms while interacting with subordinates, as various worker groups respond differently to leadership styles and motivating factors. The research report's analyzed is to determine the effect of leadership styles on the motivation of employees. The data collected suggests that the transactional leadership style negatively correlates with employee motivation. In contrast, the results of the transformational style suggest a positive relationship with employee motivation. This paper also discusses the probable reasons for the results achieved.

**Keywords:** *Motivation Theories; Job satisfaction; Leadership Styles.*

**Introduction:** In modern times, an organization cannot succeed without an effective leader or a well-motivated workforce. Leadership is arguably the most predominant aspect of human resource management because it affects productivity, morale, profits, and the overall success of an organization<sup>[1]</sup>. The most common method by which leaders are evaluated is by reviewing how well they motivate others. There are various ways to motivate people, managers use mainly empowerment and positive reinforcement<sup>[1]</sup>, but these methods can be costly in terms of money or time spent on them. Due to the abstract nature of motivation and the vast number of factors affecting it, it is difficult to quantify the motivation gained or lost as a consequence of a particular decision. This paper discusses leadership styles and their varying impacts on employee motivation, as well as analyses an experiment<sup>[2]</sup> to understand the relationship between leadership styles and employee motivation has been included. Unlike alternative publications, this report focuses solely on the varying effects of major leadership styles on employees while ignoring any effect on other aspects of the organization. This enhancement in knowledge would uncomplicate decision-making for organizations and leaders in the future and lead to higher motivation and job satisfaction for workers.

A noteworthy publication<sup>[3]</sup> makes use of primary data to study the effect of leadership on employee performance, organizational citizenship behavior, and job satisfaction in the Nigerian public sector. It identified that the Transformational leadership style is the best method to use for any organization that wishes to meet its aims through the enhanced working of its employees. This was a significant breakthrough, which provided ground for many theories (including this one) after it was published.



**Theory:** Motivation is one of the variables in employee performance that is defined as the process that arouses, directs, and maintains behavior (Woolfolk, 2013). Through studies<sup>[4]</sup> it is shown that motivated workers are more efficient and cooperative, therefore the benefits of retaining motivated workers far outweigh the cost. Workers remain demotivated usually due to feeling undervalued, having unrealistic workloads/deadlines, or poor management. Further understanding of the term 'motivation' requires certain motivation theories to be comprehended. The theories are the Hierarchy of Need theory (Maslow, 1943) which states that an individual's motivation is dependent on the satisfaction of their needs, that their needs are segmented into five groups Physiological needs, safety needs, social needs, self-esteem needs, and self-actualization needs in this particular order and that once needs at a level of the hierarchy are fulfilled, the individual will no longer be motivated through the fulfillment of those needs and will move onto the next level of the hierarchy<sup>[5]</sup>. Another theory to comprehend is the Three Needs theory (McClelland, 1961) which states that all people have three kinds of motivational needs irrespective of influences such as their culture or wealth. They are the need for achievement, power, and affiliation<sup>[5]</sup>. Both these theories and others<sup>[5]</sup> state that individuals are motivated through the fulfillment of distinct needs. Thus, we can infer that during work, a leader must satiate several wants to develop and maintain employee motivation. Leadership style refers to the mannerisms adopted by a leader while interacting with their subordinates. Different leadership styles call for different amounts and types of interactions with subordinates<sup>[11]</sup>. Certain studies<sup>[6]</sup> have established a positive correlation between employee engagement and motivation, from which it can be determined that leadership styles have vast implications on motivation and job satisfaction which is a positive feeling an individual has toward their job as a result of praise or job experience (Locke, 1976). There are numerous leadership styles namely charismatic, consultative, situational, laissez-faire, autocratic, democratic and so on. They can be separated into two main categories: transactional and transformational.

- Transactional leadership utilizes an exchange of resources to motivate workers; anything of value to both parties but are not necessarily monetary. It utilizes rewards and punishment to influence employee behavior (Hartog & Van Muijen, 1997).
- Transformational leadership is stimulating and advancing employees past personal gains (Hater & Bass, 1998) to illustrate awareness of organizational issues. Leaders aim to motivate the workers to build towards the goal by moving beyond transactions and incorporating a degree of role modeling that benefits the organization.

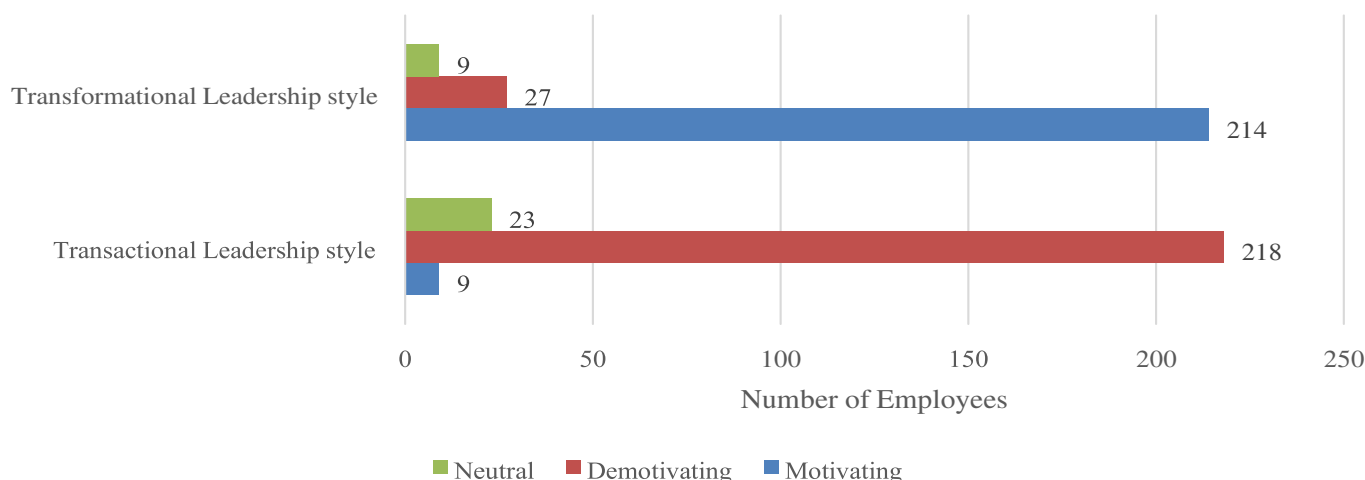
**Surveys and Interviews conducted:** The research survey and interviews were conducted in five small and medium scale companies where both quantitative and qualitative data were accumulated. 250 employees were handed the questionnaire, while 25 were interviewed. The questionnaire and interviews were crafted such that the effect on motivation in the work environment caused by a transformational and transactional leadership style could be explored, by asking the employees to state their views on the topic.



**RESULT:** In the first part of the questionnaire, 85.60% of the 250 employees firmly believed that transformational leadership was motivating while merely 10.80% opposed and 3.60% were unsure of its effect. The interview portrayed similar results, where 84% of the 25 employees interviewed believed it would be motivating, 4% considered it demotivating and 12% were unsure of its effect. Thus, we can state most employees consider transformational leadership motivating. In the next part of the questionnaire, 3.60% of the 250 employees sampled considered that transactional leadership would be motivating, 87.20% felt it as demotivating, while the other 9.20% were unsure of its effect or believed it wouldn't have any. The interview depicts comparable results where 8% of the 25 employees interviewed considered it motivating, 84% thought it demotivating and 8% were unsure of its impact or believed it wouldn't have any. Using this data, we can infer that the employees who consider the transactional leadership style as motivational are relatively low in number.

### DISCUSSION

Employee's views on Leadership styles



From the given data above, we can see that employees consider the transformative leadership style to be very motivating, while the transactional style to be vastly demotivating. Thus, we can deduce that managers who utilize the transformational leadership style will be able to effectively motivate their employees to higher amounts than those who do not. We can also infer those transactional leaders do not meet the motivational needs of the employees. A motivated workforce has higher relative efficiency and is more cooperative as shown by studies. Therefore, we can state that transformational leaders are usually more effective at making subordinates efficient and cooperative. A probable reason for these results is that transactional leaders often set unattainable goals for employees and punish them if they are not met, thus demotivating the work. In contrast, transformative leaders usually interact with the employees to form and maintain positive relations and inspire them to work towards the aims of the organization.





**CONCLUSION:** To conclude, the results of this research: the fact that transformational leaders are more motivational than transactional, is consistent with the theory that different leadership styles affect employee motivation and studies depicting a positive correlation between employee motivation and employee engagement<sup>[6]</sup>. The experiment being analyzed was conducted on similar scales of businesses thus it may not be entirely accurate as employees of larger businesses may have different opinions, in addition, the questions were self-attested so parts of the data may be incorrect due to certain subjects filling in inaccurate information (intentionally or unintentionally), making the result inaccurate. Further research must be conducted on the influence of monetary factors such as pay on job motivation by repeating this experiment with people in different income groups and different industries while keeping certain factors such as age constant to maintain experimental accuracy.

**Acknowledgements:** Humongous thanks to the organizers of the MISA LUMINOUS SPARK event for providing my fellow students and me with this fantastic opportunity to develop and showcase new research skills. I'd also like to thank my school for offering such intriguing events to partake in, and a special thanks to Miss Neha Parekh, who guided me immensely while writing this paper.

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### ROLE OF DIGITAL MARKETING IN INDUSTRIES

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#### Abstract

Marketing, like the rest of the world, is transitioning from analog to digital. The usage of digital marketing, social media marketing, and search engine marketing is growing in tandem with technological advancements. Internet users are continuously expanding, and digital marketing has benefited the most as a result of its reliance on the internet. This research paper aims to suggest a correlation between the success of the industry and the marketing strategy employed and to study the works done by other researchers in this field; also, the aim is to research the value and influence of digital marketing on the competitive establishment of the industries. We will also have a look at the results of a survey. And finally, observe the conclusion. As of now, no research is available on this concept.

**Keywords:** Small-scale industries, Large-scale industries, Digital marketing, SMEs, PPC, SEO

#### INTRODUCTION

Industry is a division of the economy that creates groups of closely related goods, or services. The goal of industrial marketing is to increase wholesale product and goods sales for industrial use. It aids raw material producers in expanding their operations. Consumer-driven advantages, advertising, packaging, positioning, price, and promotions are all used in marketing to increase awareness, consideration, purchase and preference for a product or service. Digital marketing is a type of marketing that promotes products and services by means of Internet and other online-based digital technology such as desktop computers, mobile phones, and other digital media ad platforms. As a result, most firms have learned that digital marketing is quick, far-reaching, and cost-effective. Although results imply that the size of enterprises may impact the application of digital channels, SMEs are at the bottom

of the adoption cycle. Large organizations, on the other hand, are likely to have the requisite resources and capacity to successfully use current digital channels and resources. Most small and medium-sized firms are in their early stages of development, and customer acquisition and retention are critical to achieving a marketing goal of assuring operational reach to consumers in order to increase revenue. Traditional marketing techniques appear to have moved beyond SMEs in recent years. As a result, a popular alternative, digital marketing has been widely recommended as a feasible choice for many SMEs. This will allow them to reach out to a larger market environment and raise awareness of their goods and services. However, it is critical for small firms to understand whether digital marketing can help them increase product sales in a competitive climate. They must understand how digital marketing may benefit their firm through product promotion and increased sales. This paper considers the effects of forms of digital advertising on the sales of industries.



**Small-scale industries** (SSI) are those in which manufacturing, production, and service provision are done on a small size. These businesses make a one-time investment in machinery, plant, and equipment; however, it's not more than 10 crores, and their annual revenue is less than 50 crores.

**Large-scale industries** (LSI) are defined as industries with extensive infrastructure, raw materials, significant workforce demands, and high capital requirements. Large scale industries are defined as businesses with a fixed asset of more than 10 crores.

### THEORY

Previous studies have found that large scale industries never fail while marketing due to their present resources, meaning the risk factor is almost zero for large scale industries, while small scale industries suffer due to lack of resources and proper funding; also, large-scale industries can expand and there is a greater scope for its market; however, small-scale industries have a small scope to expand. Large scale industries need proper planning to sustain and grow in their field but won't be as affected as small scale industries because if there will be any loss to these small industries they are at a higher risk to dig into a deeper debt. So for small-scale industries, planning is mandatory to grow. Due to this reason alone, SMEs should use marketing wisely (with strategies) to grow. Market growth develops as a result of organizations' outstanding exploitation of resources and capacities employed to enable expansion. It includes abilities, knowledge obtained, skills, and economical guidance. Growth is significantly influenced by market structure and innovation, and there is a strong likelihood that small, innovative enterprises will develop quicker than large corporations if they use digital marketing wisely. Since both industries grow with digital marketing, we will look at the strategies that can be used to grow exponentially in the current market.

### LITERATURE REVIEW

A plethora of research has concluded that digital marketing adoption has a positive effect on business sales (be it small or large scale). On the contrary, some revealed that digital marketing had a negative impact on organizational returns; however, one research discovered a mixed effect of digital marketing on firms. As per another research, the path to increased income was found through enhanced communications provided by the use of social media. Another research on digital marketing, focused on business company brand loyalty. The study's findings indicate that social media marketing has a positive effect on customer retention in firms. A research explored the role of internet marketing on the success of small and medium enterprises, discovering that a significant percentage of small firms are concerned about losing current clients if a social media marketing platform is used. However, the implementation of social media methods resulted in an increased market share, expansion, and profitability for SMEs. A group of researchers investigated the elements that influence relationship marketing efficacy. Developing relationship advantages, creating customer reliance, as well as enhancing resemblance to clients, amongst numerous variables, were found to be more successful techniques for increasing client loyalty than establishing trust.

#### Digital Marketing

The following shows ways in which marketing is used by different organizations:

❖ **Search Engine Optimization (SEO)** is a method of structuring the contents of a website to



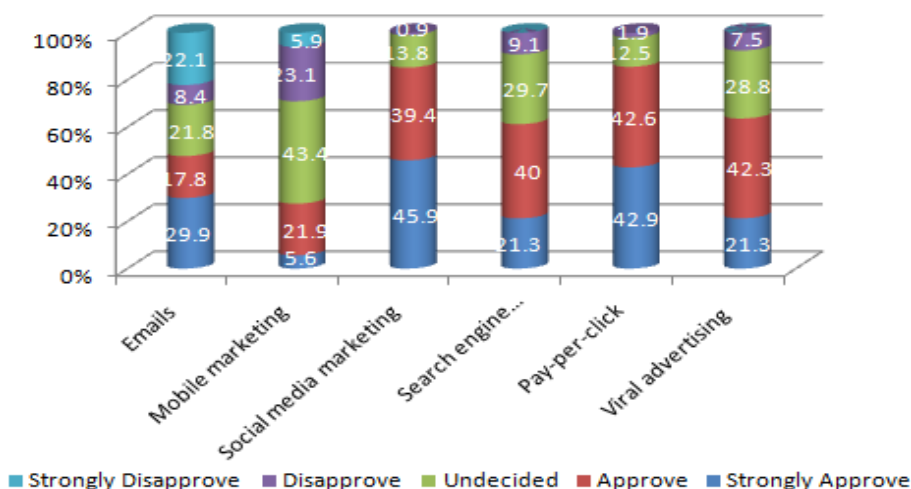
meet what business prospects are looking for and displaying it in a way that is widely obtainable to both users and search engines. The organic or natural search results are indeed the place to be if a company wants to improve targeted traffic to its website.

- ❖ **Pay-per-Click (PPC)** marketing enables firms to be highly featured on search pages for specified keywords and categories in exchange for a fee. Due to the type of business and the precise phrases they want to rank for, it is seen as an efficient strategy to quickly create search engine traffic. Despite the fact that pay-per-click advertising is growing more widespread and competitive, keywords are becoming more expensive for small firms.
- ❖ **Social Media Marketing** is a method in which advertisements are put on search engine results pages, advertisements embedded in emails, and other methods wherein marketers have been using the internet are all examples of online marketing. The main goal is to get a potential buyer to act right away by clicking on the advertisement. These ads are intended to elicit a variety of responses from targeted users and to achieve a variety of marketing communications goals, including increasing engagement, shifting selections, and increasing retention.
- ❖ **Email Marketing** is indeed one of the initial forms of online marketing, and it entails sending specialized or customized messages to certain individuals at the right moment. Businesses will send emails that are tailored to the needs of their customers. The use of a wireless medium to supply clients with time and location-specific information that promotes products, services, and ideas is known as mobile marketing. As a result, it demonstrates the connection between consumers and their mobile phones, as well as the consumer brand relationship and the capacity of mobile advertising to manage the viewing environment, allowing marketers to build a more meaningful brand relationship.
- ❖ **Affiliate marketing** is a type of digital marketing in which a digital user or website advertises an online business and receives a payment based on the number of sales or enquiries produced for that store. In this situation, the third party gets money every time a potential buyer clicks on the hyperlink supplied by the marketer. Viral marketing combines numerous aspects of digital marketing and entails spreading messaging material through various outlets. It may contain YouTube videos, email marketing, and other conventional elements, all with the objective of ensuring that the content gets the market's interest and spreads to other communities.

### PERSONAL SURVEY

**Table 1** Analysis of adoption of digital marketing in industries [Field survey, 2019]

Variables (Frequency)	Strongly Approve	Approve	Undecided	Disapprove	Strongly Disapprove
Emails	96	57	70	27	71
Mobile marketing	18	70	139	74	19
Social media marketing	147	126	44	3	0
Search engine optimization	68	128	95	29	0
Pay-per-click	137	136	40	6	0
Viral advertising	68	135	92	24	0



### DISCUSSION

A survey conducted online, provided insights for forms of digital marketing. Here, the bar chart shows how Nigerian businesses employ various digital solutions where Social Media and Pay-per-click is mostly used. 29.99% strongly believe in Email, 17.8% approved this while 8.4% opposed the use of email as digital marketing tool, while 22.1% of the respondents agree with the results but strongly disagree with the use of email as a tool. However, a majority of respondents (47.7%) agreed to use email, while 21.8% were uncertain only 5.6% of respondents highly favour the usage of mobile marketing, while 21.9% of respondents corroborate. However, 23.1% of respondents oppose the usage of mobile marketing as a digital marketing alternative, while 5.9% support the substantial degree of opposition to mobile marketing. In the Nigerian company climate, it appears that a bigger number of respondents are using social media marketing. According to the findings, 45.9% of respondents strongly believe that using social media marketing as a digital alternative for marketing their organisation is a good idea. This is backed up by 39.4% of respondents who said they would utilise social media in company digital marketing. On the contrary, a small minority of respondents (0.9%) believe that media marketing is frequently used. 21.3% of respondents totally favour the use of SEO in digital marketing, with 40.0% supporting it. The usage of SEO as a digital marketing strategy was opposed by a large majority of respondents (9.1%). In Nigeria, 42.9% favour the use PPC in digital marketing. However, less than 2% of respondents agreed that PPC should be used for digital marketing. 21.3% of respondents highly favour viral marketing as a digital marketing strategy, which is backed up by 42.3% of respondents; 28.8% are unsure, and 7.5% disapprove.

### CONCLUSION

Industries can expand their firms by all of the strategies mentioned above according to their funds but the ideal way for growing is that, as small-scale industries may be able to obtain potential customers through digital media such as social media and e-mails, which are known to be inexpensive, while medium businesses can use digital tools such as pay-per-click (PPC), search engine optimization (SEO), online advertising, and viral marketing since they require



some money to market. Overall, every strategy is effective (social media marketing being the most effective).

### Acknowledgements

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## UNDERWATER WIRELESS SENSOR NETWORKS FOR DISASTER MANAGEMENT

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### Abstract

About seventy one percent of the Earth consists of seas, oceans and lakes. Some of the violent natural disasters that have destroyed millions of lives over the centuries originate from the sea like tropical cyclones, hurricanes and tsunamis. Above 227,000 people died in the Indian Ocean tsunami of 2004. Since then, pre warning technologies are gradually emerging, which has significantly decreased the death toll. In this paper we propose an early warning for natural disasters originating from the sea. This system uses wireless communication.

**Keywords:** *wireless sensor networks, natural disasters, wireless communication, underwater*

### INTRODUCTION

The high death toll caused by tsunamis, hurricanes etc. has underlined the need for proper, efficient pre-warning systems to be set up. This paper discusses a way to sort out this problem by placing a system which operates by wireless communication. Wireless communication is more advantageous than cabled connection as the latter faces problems such as breaking or fraying of wires, significant cost of installation, which is ineffective if the experiment is temporary and, most importantly, the inability to set up over long distances. In this paper, we put forward a completely wireless pre warning system to warn against tsunamis, hurricanes and cyclones. Sensors, both underwater and surface, are deployed in the sea to collect measurements which indicate toward a possible disaster. Different types of sensors are deployed such as temperature, humidity, pressure, depth, wind speed etc. as well as cameras. The surface sensors will be mounted on buoys whereas underwater ones will be anchored to the sea bed. Wireless communication types are discussed further like optical, acoustic, radio frequency etc. and the best one is decided.

### Types of Natural Disaster

#### 1) Tsunamis

Tsunamis are formed when there is an earthquake, landside or volcanic eruption on the sea bed. This activity displaces a huge amount of water, where the energy travels in the form of huge waves at the speed of a jet plane. When a tsunami strikes the beach, the force and size of the waves carries the water inland, leading towards flooding, potential destruction of structures such as houses and objects like cars and human loss. There are signs which indicate the occurrence of a tsunami. Firstly, the coastal area mainly will experience a strong earthquake for more than 20 seconds. A more reliable sign is the abrupt and steep fall in the level of water - the water draws



far back into the ocean, revealing the sea floor. On the sensor level, tsunami conditions are reached when seismometers detect heavy displacement of sea floor, sound sensors detect large noises and AI systems in underwater cameras detect a great shift in the sand. When this occurs, immediately a warning is issued which leads to evacuation of potentially threatened areas. Currently, there are hazard signs such as those shown in Fig. 1 in frequently impacted areas.

### 2) Hurricanes and cyclones

Both are the same phenomenon but are named on the basis of the places where they occur. Hurricanes form over the North Atlantic Ocean and Northeast Pacific whereas cyclones are formed over the South Pacific and Indian Ocean. Warm, moist air over the surface of the water, being less dense, rises up and creates an area of low pressure, where more high-pressure air comes in. This air again rises up. This cools the water in the surrounding air to form cloud as which along with the wind, spins and enlarged, eventually forming an 'eye' in the middle. The eye is very calm with very low pressure. This forms a cyclone or hurricane. During cyclones, the coastal areas experience heavy rains and strong winds. These lead to further disasters like landfalls, uprooting of trees and houses. Some of the traditional signs of approaching cyclones are: banana leaf stalks making eerie sounds; migratory birds leaving earlier than usual is a sure sign of approaching strong winds and cyclones; and if the winds blow in the southwest or northwest direction, then it is likely that a cyclone is on the way. On the sensor level, pressure sensors detect sudden changes in pressure, temperature sensors measure a high temperature and wind direction and speed detect rotating and very high-speed winds. The sensors will then relay the information to the onshore disaster management systems which will issue necessary warning.

### **Types of Under water Wireless Communication systems**

#### 1) Acoustic

Acoustic waves are used as the primary carrier for underwater wireless communication systems due to the relatively low absorption in underwater environments.

#### 2) RF

RF electromagnetic system provides noticeable advantages of radio waves over the acoustic and optical waves in shallow water conditions.

#### 3) Optical

Optical system provides highest data transmission. However, the light can get deflected irregularly or absorbed by the water currents.

### **My System**

The system proposed is relatively simple and will be theoretically efficient if put into place. The system works as follows: Offshore, there will be several clusters of underwater sensors as shown in Fig. 1 and Fig. 2. The underwater sensor types are temperature, pressure, depth and cameras. In the rough center of the cluster on the surface of the water a buoy will be present which will also be equipped with sensors like temperature, humidity, wind speed and cameras. The sensors will relay constant measurements to the buoy which will then transmit the data wirelessly through optical/acoustic communication to an onshore pickup station. If the conditions for natural disasters such as high temperature at the surface of the water, high wind speed, the buoy



will issue a warning to the onshore station which will be connected to the municipal authorities of the city as well as the military. Once the municipal authorities get the alert, a disaster warning can then be announced for immediate evacuation. As the alert reaches the military, evacuation can be commenced. This will greatly reduce and hopefully eliminate human loss.

figure 1 – 2D model of tsunami and hurricane pre- warning system

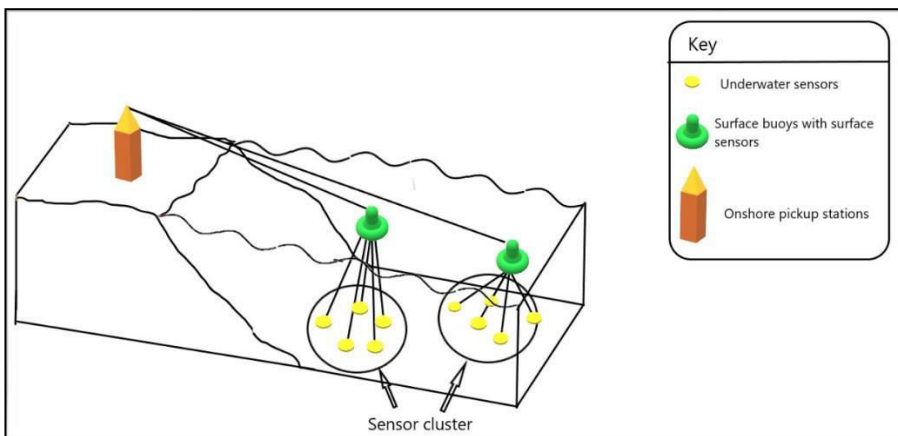
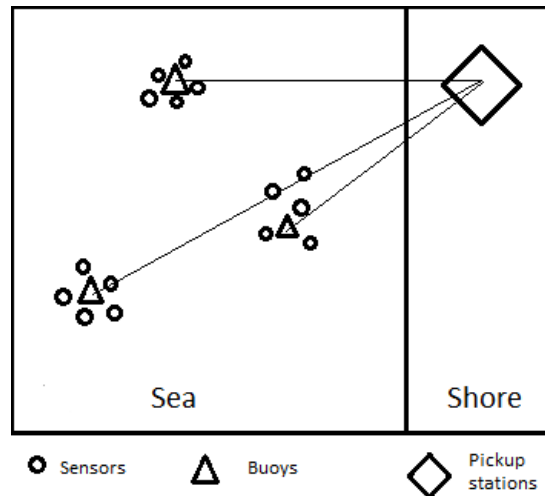


Figure 2 – 3D model of tsunami and hurricane pre warning system

### CONCLUSION

The system proposed above not only will help in monitoring the offshore environment but will also be able to give us reliable forecasts. Possible to set up on large distances. Although prone to damage underwater, the equipment will need frequent maintenance. The upgradation of equipment can be done in stages, for example, sensors can be replaced in areas where they are most required.

### Acknowledgements

I would like to express my special thanks to my teacher Mrs. Clarine Saldanha who gave me the golden opportunity to do this wonderful project on the topic of Improvisation in Wireless



Underwater Communication for Disaster Management which also helped me in doing a lot of research and I came to know about so many new things. Secondly I would also like to thank my parents who helped me a lot in finalizing this project within the time frame. I am really thankful to them.

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### A LITERARY REVIEW ON COMPUTATIONAL SYSTEMS, MODELING AND SIMULATION AND THEIR CONTRIBUTIONS TO MEDICINE

**Daksh Malhotra**

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#### **Abstract**

This paper aims to provide an overview and explanation regarding the impacts of developing technology within the medical sector. Throughout this report, concepts being implemented such as virtual simulation have been seen to aid medical specialists in achieving better outcomes, thus helping healthcare progress from uncertainty to precision.

**Keywords:** *Spatial visualization, Anatomical training, Computer aided designs, Radiation therapy.*

#### **Introduction**

Medicine involves a multitude of methods, some of which have undergone years of evolution and calibration, to prevent and treat illnesses. Computational Medicine helps to advance healthcare by developing computational models of disease, personalizing these models using data from patients, and applying these models to improve the diagnosis and treatment of disease. The reader possessing a basic understanding of operations carried out by 3D software would be ideal so as to have a comprehensive understanding of the content in the paper. Few contemporary modalities require acute precision in order to effectively treat patients, and have been capped so far by cost and limited availability of resources and training required to carry out procedures.

#### **Theory**

Biological systems and interactions can be simulated accurately using computer science, physics, and mathematics. A number of variables are programmed into a computational model to characterize the system being studied. By adjusting these variables in various combinations, the outcome can be observed, providing valuable data for researchers. Incorporating computational modelling to complement traditional in vitro and in vivo experiments is a paradigm enabling reliable methods of disease diagnosis, understanding biomolecular structures and biomaterials, innovative therapies, tissue engineering and regenerative medicine. The possibilities being limitless, computational modelling is transforming medicine.

For instance, we cannot touch a beating heart, but we can use modelling to infer important diagnostic and prognostic information. The increasing amount of available data from wearable sensors to digital medical images has also sped up the applications of modelling.



In recent times, event based surveillance models like GPHIN (The Global Public Health Intelligence Network) are being used to track infectious diseases, monitor them and identify interventions to reduce spread of the disease and predict future outcomes. These models and calculations were widely used during the COVID -19 pandemic, with scientists trying to predict how the SARS-CoV-2 virus would spread. GPHIN came into the spotlight during the SARS outbreak when, from November 2002 and February 2003, it issued the first alert of unusual respiratory illness in a province in China to WHO and GOARN members, setting off an international chain response [1].

The use of computational modeling and simulation in medical device development through virtual prototyping helps predict device performance and allows research and development earlier in the design process, though this requires high quality data and sufficient evidence is needed for clinical translation and formidable mathematical challenges involved.

Apart from surgical and design based aspects, medical simulation is utilized in training healthcare professionals through the use of advanced educational technology, which allows the acquisition of clinical skills through deliberate practice rather than an apprentice style of learning and is the future in an ever evolving healthcare. Anatomy is one of the core courses in medical education which traditionally uses wall charts, books, slides, anatomical specimens, and practical anatomy as teaching resources and methods. With the expansion of medical education and the reduction in human anatomical specimens, as well as the limitations of time and place for anatomical training, the quality of teaching has been severely affected. Anatomy is a discipline where spatial visualization is of importance. Students need to learn not just structures and functions but also spatial relationships to surrounding structures. Given the needs of anatomy teaching, the use of virtual reality (VR) technology to construct a virtual anatomy teaching system, could therefore provide real and reusable teaching resources for anatomy teaching. In addition virtual anatomy teaching systems have the advantages of multi-level, multi-angle specimen observation and non-destructive virtual anatomy, among others. Simulation tools serve as an alternative to real patients, and a trainee can make mistakes and learn from them without compromising the safety of the patient.

Patient specific models and simulations can help predict clinical outcomes and keep the promise of a tailored treatment. Operating alongside 3D software, 3D printing allows support diagnosis, treatment and surgical planning. These creations provide clinicians with critical context and details regarding the patient's anatomy that routinely change clinical approaches and impact patient outcomes. Medical modeling through collaboration between various departments enables highly accurate segmentation and 3D printing can enable surgery that could not have been performed otherwise.

Vis a vis neurosurgery, 3D Simulation starts with imaging, CT and MRI scanning sequences, alongside appropriate applications of more advanced imaging, which are used as input to all downstream simulation. The 3D structural models of the brain are formed from imaging data and interpreted.

During the generation of 3D data, structures in the head that are most important for the patient's pathology are identified within the radiological imaging and segmented from its surroundings. In particular, once a brain tumor is identified and modeled from the 2D imaging data set to produce a 3D model of the tumor, the brain's blood supply, or vascular network, and



bony anatomy are modeled, in addition to more complex structures such as cranial nerves. The result is a set of models that accurately reflect the relationship between structures of the brain that are critical for the planning of the operation.

Once 3D data has been generated, it can be used in many ways. A typical pipeline will display the data pre-operatively to the patient, for improved understanding and confidence in the approach, and to the surgeon for procedural planning. These models are used to plan minimally invasive approaches to the skull base on the model itself, making it a trial run for the actual surgery.

3D Imaging and Simulation programs remain of huge assistance in areas of radiotherapy. The risk of missing the tumor is moderately high due to motion of organs or a setup variation may cause radiation to be slightly diverted to the patient's normal organs [2]. Systems like IGRT (Image Guided Radiotherapy) detect possible errors and makes room for corrections through data derived from pre radiotherapy imaging. The added accuracy can allow an escalation in radiation dose values [3]. In continuation and addition, SBRT (Stereotactic Body Radiation Therapy) is used to precisely deliver high dosages of radiation to eliminate small, defined oligometastatic tumors at any position in the body [4]. Though the high amount of radiation can damage immediately surrounding tissue, this tissue is tiny and usually non eloquent, thus clinically significant toxicity is less [5].

### Result :

Computational simulations, modeling, virtual reality and a few other methods currently contribute towards healthcare and have established their position in the fundamentals of modern medicine.

### Discussion :

The results indicate a growth in the simulation market, as well as a sizeable increase in the implementation of 3D modeling and virtual reality in healthcare due to their proven effectiveness.



Fig 1. Global Medical Simulation Market distribution as of 2020. Hospitals and Academic Institutes shown in dark and light purple respectively

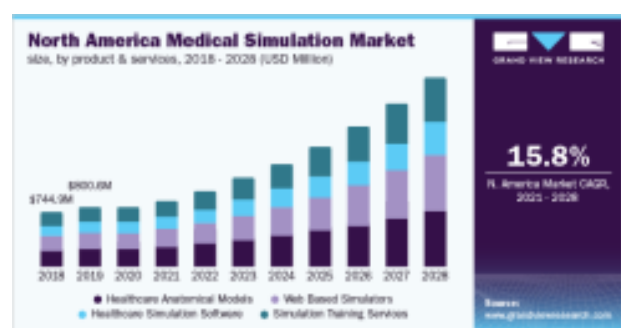


Fig 2. Estimated growth of the North American Medical Simulation Market until 2028



### Conclusion :

Through their widespread applications, computerized modeling and simulation in multiple aspects of the medical sector have turned into a powerful strategy to effectively prepare professionals to address the problems of the modern world.

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### CONTRIBUTION OF COMPUTATIONAL SYSTEMS, MODELING AND SIMULATION IN MEDICAL ADVANCEMENT

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#### **Abstract**

Computational systems, modeling and simulations have become an integral part of the medical field, especially in Emergency Medicine (EM). This research paper is a study of the application, uses and limitations of computational systems and their contribution to medical advancements. This paper includes a review of the data analysis based on conducted studies and interpretation for the accurate diagnosis and treatment of diseases. This paper also includes the background and analysis of the foundations of computational tools used in medicine today.

#### **Keywords**

*Contribution:* the part played by a person or thing in bringing about a result or helping something to advance

*Computational:* using or relating to computers

*Systems:* a group of related hardware units or programs or both, especially when dedicated to a single application.

*Modelling:* devise a representation, especially a mathematical one, of (a phenomenon or system)

*Simulation:* the production of a computer model of something, especially for the purpose of the study.

#### **INTRODUCTION**

Computational systems are programs of hardware/software that portray mathematical representations or models of a unit based on a specific data set.

Computational systems in medicine require collaborative inputs from analysts, mathematicians, physicians, bioengineers, and researchers for an effective output. They involve the use of mathematical modelling and are applied for the treatment of cancer, providing precision dosages of drugs, cardiovascular medicine, prototyping, etc. These systems address the need for the interpretation of quantitative data and predict cellular capacities. These systems facilitate the simplification and increase the accuracy of several medical procedures.

#### **Application:**

**Training:** Computer simulations provide physicians training in healthcare a learning opportunity by mimicking clinical scenarios and planned exposures which help training in emergency communication skills and team training without any patient risk.



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**Medical imaging and informatics:** using computational systems for X-rays, MRIs, CT scans, ultrasounds, etc.; computers play a significant role in the organization of data using information networking. They are also used to develop and design other medical devices.

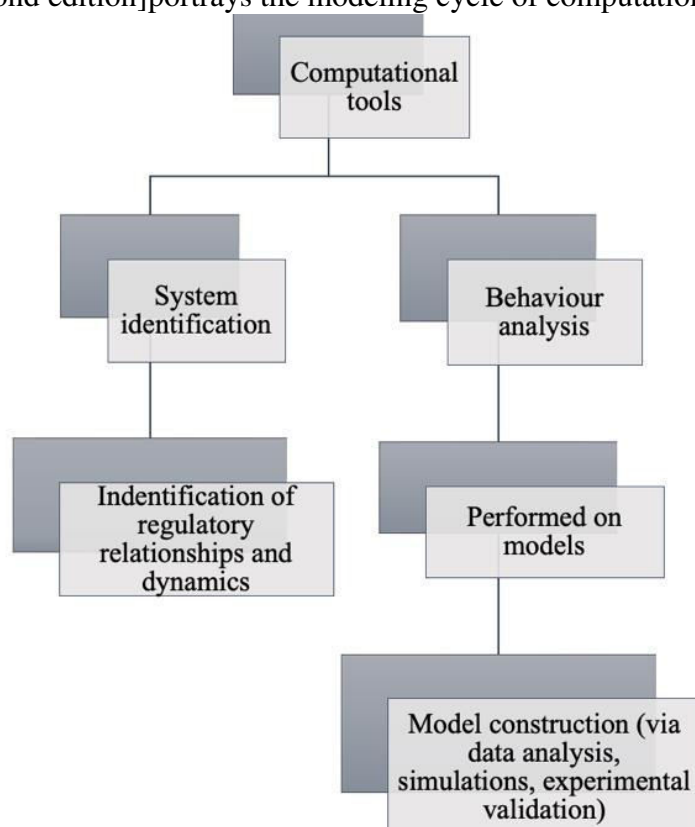
**Data analysis:** software statistical packages such as the biomedical computer package (BMD), Statistical package for the social sciences (SPSS), GenStat and Epi-Info are commonly used for medical research.

**Laboratory computing:** running tests and providing accurate and valid results in a short time frame. They also help in predicting the possible effects of drugs.

**Computer-assisted decision making:** they assist doctors with clinical decision making and regulating the dosage of treatment for patients.

**Limitations:** Prevents a deeper understanding due to complexities and non-linearities; can be misused (unintendedly) if not user-interface friendly.

A chart [formed and adapted from Roland Eils' and Andres Kriete's "Computational Systems Biology", second edition] portrays the modeling cycle of computation tools.



### Statistical Analysis:

As per a study conducted by the Progressive Clinical Practice, it was concluded that Emergency Medicine (EM) learners associate technology-enhanced simulation with gaining more favourable effects compared to other instruction. The study was conducted with the identification of 85 EM learners. The study shows that most students find technology-enhanced simulation to be the most

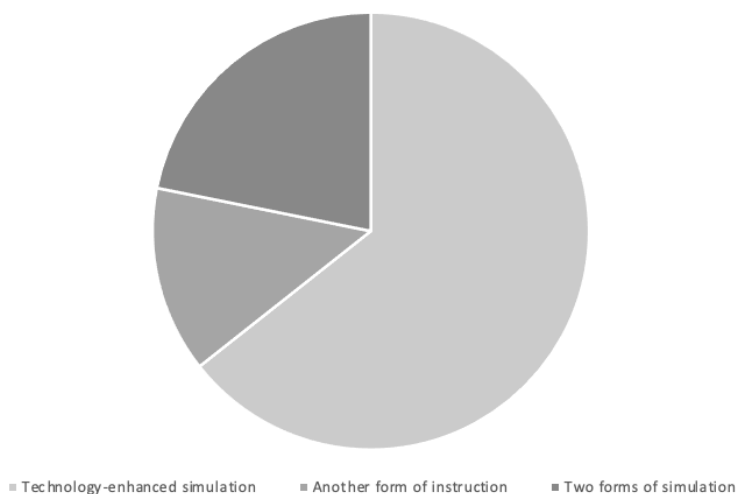




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favourable instruction method, resulting in long-term advancements as simulations are a more accurate form of instruction with minimal/no sources of human error.

Comparison of different forms of instruction based on favorability of EM students



### RESULT

Computational systems, modelling and simulations have notably contributed in the advancement of healthcare with the introduction of technology which results in wholistically improved patient treatment.

### CONCLUSION

Computational systems are developing over the past decade with respect to visualization, interpretation, analysis, and storage of aggregate quality data. They are essential in the field of medicine for effective and accurate treatment of patients. They have contributed significantly to medical advancements with the interpretation of biomedical data which consequently contributes to the appropriate diagnosis, treatment, and prevention of diseases.

### Acknowledgements

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PMCID: PMC6257447

PMID: [30510351](https://pubmed.ncbi.nlm.nih.gov/30510351/) APPLICATION OF COMPUTER TECHNIQUES IN MEDICINE

VK MEHTA, \* PS DEB, Dr,<sup>+</sup> and D SUBBA RAO<sup>#</sup>

3. “Technology-enhanced Simulation in Emergency Medicine: A Systematic Review and Meta-Analysis”

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### IT TRANSFORMS THE MEDICINAL WORLD

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#### **Abstract**

The medical sector has been changed by information technology in recent years. The accuracy with which biological systems and exchanges may be duplicated has greatly improved the data collection process. Computer modeling and simulation techniques are particularly important in changing not just how medicine is done but also how it is taught. To further aid in the development of a more reflective understanding of the mechanisms and factors that underlie the diseases that are characteristic of human biology, computational modeling approaches play a significant part in the research of crucial molecular processes and pathways.

**Keywords:** *computational science, computational modeling, simulation, technology*

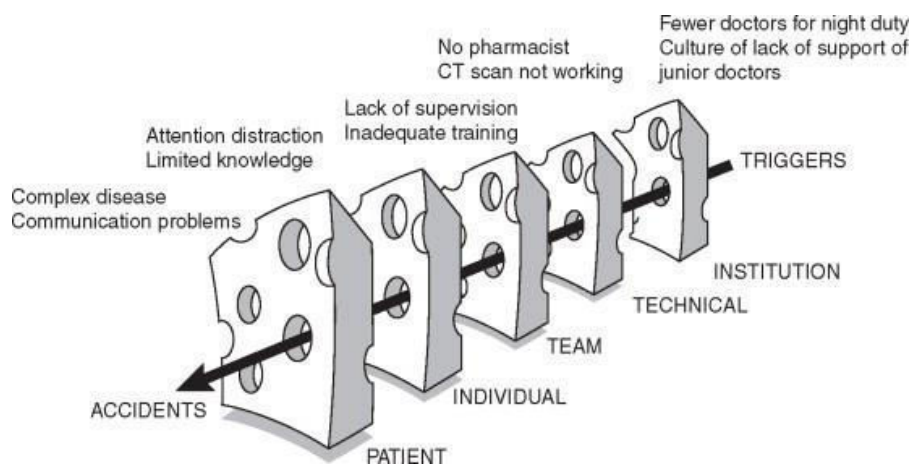
#### **INTRODUCTION**

Utilizing computers to mimic and investigate complex systems while applying engineering science, physics, and mathematics is known as computational modeling. A computational model includes a number of variables that represent the system under study. Adjusting the variables individually or in combination and seeing the outcomes completes the simulation. Computer modeling enables scientists to run a variety of computer-simulated experiments. The notion that computer simulation and modeling might offer additional quantitative explanations of how the neuromuscular and musculoskeletal systems interact to facilitate movement has grown significantly in recent years. Models are the most straightforward way to record our knowledge. This can be modified to support a task that might call for simulation, producing a more narrowly focused and specific conceptualization that serves as the basis.

#### **Theory**

Each patient's attributes are gathered, sorted, and examined by computer models for disease therapy to help the patient, and guide doctors. Throughout the course of treatment, the systems assist in giving patients knowledgeable and reliable care. The following other areas of medical research also use computer modeling:

- Tracking infectious diseases — With the use of computational modeling, researchers can keep tabs on infectious diseases in populations, making for a more useful contribution. Computational modeling can also forecast how outbreaks would spread through populations and finding and altering actions leads to a more effective response that saves lives during pandemics.



- Clinical decision support - Computational modeling assists physicians in deciding how best to treat patients' diseases and provide dependable care in hospital settings. Based on the particular and intricate qualities of each patient, this is.
- Predicting adverse drug side effects — Using computational models, scientists can estimate the likelihood of a drug having any harmful consequences. Additionally, by employing the precise data generated by computer modeling, safe and effective medications can aid in development.
- Design and development of medical devices - Computational modeling is used to support the design and development of a wide range of medical devices utilized today.

### FIG - 1

Despite having reasonably solid foundational knowledge, doctors have been found to be lacking in clinical skills, problem-solving, and application of knowledge to patient care. This is especially true in unexpected scenarios. Medical education was changed to a system-based core curriculum with learning objectives focused on cognitive, psychomotor, and emotional domains in order to assist alleviate this. The goal was to create a persistent, predetermined change in the learner's behavior, abilities, and attitudes that leaned toward PBL. While employing simulation for educational reasons, the patient's ethical and legal rights were also addressed. If a patient refuses to participate in a teaching program out of fear that their care may be compromised, their permission is no longer valid. Any payment made to the patient to cover costs and annoyance associated with participation may qualify as an inducement, especially if it goes beyond what is acceptable as "fair remuneration." The consent could thus be deemed invalid as a result. Additionally, as most medical schools maintain patient data, concerns over confidentiality and data protection must be addressed if both clinical and non-clinical staff have access to it.

### Experimental

The applications of modeling have been enhanced by the expanding availability of data from wearable sensors to digital medical pictures. A team at Kings College London combined state-of-the-art silico cardiac models with heart-related medical images to produce patient-specific stimulated heart models, or "digital twins." The use of cardiac resynchronization therapy (CRT) in people with heart failure is another illustration. In order to improve electrical activation and synchronize the pounding of the two ventricles, this procedure includes inserting two pacing



leads controlled by a pacemaker into the patient's heart. Traditionally, electrocardiograms (ECGs) and medical pictures are used to determine where the leads should be placed and when to stimulate them, however, 30% of patients do not find this method to be transparent.

During the COVID-19 pandemic, computer modeling has received attention, with scientists attempting to anticipate how the SARS-CoV-2 virus will spread. Additionally, computational models help medical professionals better understand how a tumor's micro-architecture affects how fluid and mass are distributed throughout cancerous tissue. This understanding is crucial for developing new anti-cancer drugs or refining the methods of existing therapeutics.

### RESULT

In the future, models like digital twins might give clinicians vital knowledge about cardiac characteristics like heart stiffness that are currently unavailable. This is crucial because stiffness can hinder the ventricle from adequately filling up as the heart fills with blood (during diastole), a characteristic linked to heart failure in nearly half of patients.

Doctors can determine the ideal place to electrically stimulate the heart and research the consequences of modifying the pacing by creating computational heart models from the patient's images and modeling various pacing tactics on them.

### DISCUSSION

Chronic cardiopathy patients need to have their condition closely watched in order to head off any potential life-threatening events. Around 230 million people have cardiac diseases, and up to three million people die each year as a result, according to WHO figures. The collection of data regarding the patient's cardiac health, real-time transmission of that data to the doctor, and analysis of that data can all be considerably sped up and made easier thanks to the Internet of Things technologies. According to the article, creating a digital twin can be a very time-consuming and expensive task that will also make keeping track of patient's health in a hospital more difficult. In order to make outcomes more predictable, evaluate them, and incorporate this strategy into healthcare more efficiently, research on digital twins must ascertain which data are most important to these factors. In the end, when properly applied, digital twins can assist in enhancing diagnostic and monitoring capabilities, therapy, and patient wellbeing, lowering expenses, and expanding treatment alternatives and patient options. There is anticipation that modeling will deliver the necessary accuracy of outcomes for the parts of modern commercial systems. Computational Systems, Modeling, and Simulation (CSMS) assist in the analysis of patient data, forecast the effects of various therapies by comparing them to historical data of a similar patient, and assist in the suggestion of better options that are appropriate to the patient. This further assists in extending the possibility of effective treatment and reducing the potential side effects, assisting in the achievement of customer satisfaction and better quality of life. The transition from healthcare systems built on describing disease to healthcare systems centered on predicting response will be made gradually by the digital twin, which will also gradually contain customized computer-enabled decision points. This will change the way treatments are chosen from being based on the patient's condition today to optimizing the patient's condition tomorrow. Despite having their share of white practitioners, computational systems, modeling, and simulation also include several black practitioners. First and foremost, there will be difficulties to overcome, such as those caused by globalization and new industrial methods.



Additionally, it will be difficult to manage all the design data for the digital twin among partners and suppliers when the physical product changes.

### CONCLUSION

These computer models are utilized to depict physical marvels, from surgery to medication design, as well as to obtain useful information and even guide clinical decisions. Medical imaging systems and three-dimensional computer models have revolutionized our understanding of cardiac architecture and function. It is anticipated that the development of methods for creating 3D, individualized cardiac models would have an effect on heart problem diagnosis, therapy planning, and prevention.

As soon as individuals realize how computational science may assist them in solving problems that cannot be solved using conventional methods, the tidal wave will begin. Additionally, compared to traditional techniques, surgeons who utilize the robotic system report that it improves precision, flexibility, and control throughout the operation and lets them see the spot more clearly. Surgeons can carry out delicate and intricate treatments using robotic surgery that might be challenging or impossible with other techniques. Minimally invasive surgery is frequently made possible by robotic surgery. Fewer complications, such as surgical site infections, less pain and blood loss, a shorter hospital stay and quicker recovery, and smaller, less obvious scars are all advantages of minimally invasive surgery. Robotic therapies are already being used in Korea and Japan and are likely to be reproduced and made available globally. Furthermore, information technology enables doctors to provide better treatment to patients by allowing them to operate without having to travel to the patient or vice versa, and the doctor can assist doctors near the patient via video calls.

### Acknowledgments

I want to express my gratitude to my teachers, parents, friends, and relatives for helping me put this report together.

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## DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES

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### Abstract

Digital marketing means advertising and selling products or services using digital mediums like the internet and display advertising. Digital marketing started in the early 1990s and has been evolving and increasing ever since, with new platforms being introduced and new strategies being made and enforced on a regular basis. With the increase in consumers using online services instead of traditional shops, digital marketing is becoming more crucial by the day. This research paper will be focusing on the growth of digital marketing in different types of industries.

**Keywords:** digital marketing, small-scale industries, large-scale industries, consumers, strategies

### Introduction

Digital marketing, also known as “Internet Marketing”, has been growing rapidly in all different industries all over the world. Digital marketing is helping bring about new industries into the market which would’ve failed to exist if it weren’t for digital marketing. It has also helped many consumers choose their right products by adding Social Proof (allowing people to rate and review the product), Bright Local, a USA and UK based marketing company, who has helped market for companies like Bloomberg and CNBC released a study showing that 85% of people have now started trusting online reviews and buy products regarding them.

### Theory

In 1971, the first email was sent, giving rise to a new technological platform we now use on a daily basis. By the 1980s computer’s storage capacity was enough to store personal information of customers. It was then that companies started to shift towards digital mediums as there it was easier to gain more information about the customer, this also helped create better and longer lasting relationships between the company and customers. In 1990, during the debut of server/client architecture the name “Digital Marketing” was used and assigned to the







act of advertising and gaining customer acquisition online. By 1998, search engines like google, YAHOO market web search and Microsoft MSN were rapidly taking over the market leaving behind small search engines such as HotBot. By 2006, search engine traffic was around 6.2 billion. In the US digital marketing had been booming ever since the rise of YAHOO, a study shows that by 2004 internet advertising and marketing had already earned \$2.9 billion (USD).

### Experimental

Many experiments have been conducted to know which type of digital marketing works best for companies. OptinMonster, a marketing company that helps formulate marketing strategies for small industry businesses, did a study to find out how email marketing compares to other forms of digital marketing for small scale industries. On the other hand, large scale industries are experimenting with the use of social media platforms and influencer marketing on their products. Marketing agencies are also researching what all industries do most people shop online from.

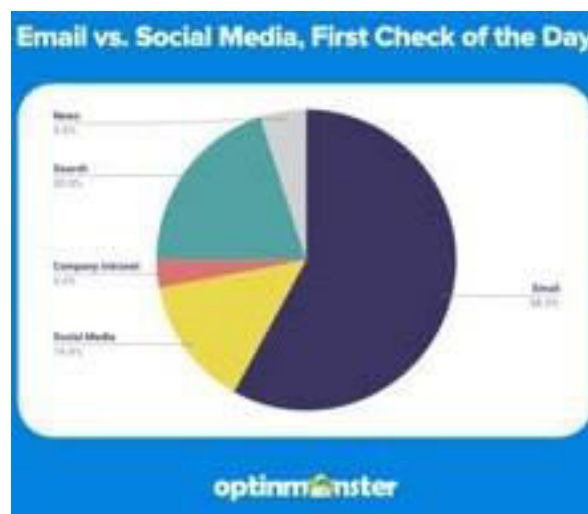
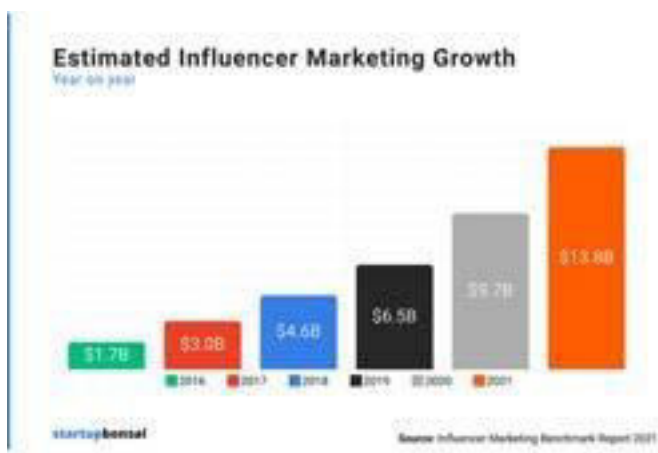
### Result

The experiment on email marketing showed that businesses send around 126.7 trillion emails a year and email subscribers receive 13 emails from businesses every day. In their article they released that 14% of people check social media first while 58% of people check email first. Influencer marketing, by 2022, is a \$16 B industry. With the increase in people on social media platforms influencer marketing is becoming very popular for businesses. In 2021 the number of influencer marketing services increased by 21%. OptinMonster, did a study relating to division of sales (online shopping and traditional shopping) for different industries, in which it worked out that the finance and non-profit sector has the highest percentage of online sales.

### Discussion

Small Scale businesses find it easier to send out emails as a form of marketing as it helps them make strong, lasting relationships with their customers using personalised emails. It is also more efficient for them as their social media reach would normally be low hence advertising on social media may be a waste of money. Most people check their emails almost 20 times a day. 54% of people check email as their first task of the day. In today's time, more than 80% of American adults read their emails on a regular basis. For small-scale industries, emails can be a good way to advertise their brochures and new schemes as a way to remind customers of the business and inform them of new ideas getting incorporated into the business. Influencer Marketing, which came in the limelight in 2016, has now become one of the most efficient ways to advertise for large scale industries. This style of marketing has been growing rapidly and taking over the whole marketing industry, it has been projected to grow further and The textile industry, which is known to be one of the largest industries in India started having brand ambassadors as a way of influential marketing. Raymond, an Indian textile and clothing brand, got their first brand ambassador Farhan Akhtar, an Indian actor, to wear their designs on the red carpet and advertise for them. The healthcare industry, which is one of the largest industries in the world, started using influencer marketing a lot during the COVID pandemic for vaccinations, not only did influencers raise awareness about the vaccines on social media, some of them also partnered up with the government to give out free vaccines for those in need. Global Citizen,

an NGO, partnered up with many celebrities such as Prince Harry, Meghan Markle and 15 others to advertise the COVID vaccines during the Vax Live concert in L.A. Small scale industries also use influencer marketing with micro influencers, these influencers have a smaller fan base which makes it cheaper and easier for small-scale businesses to afford while they also help them reach new audiences. Studies show that companies offering influencer marketing campaigns have also significantly grown over the years especially during the lockdown as traffic on social media platforms had also increased. Another vital experiment conducted was to see the breakup of different styles of sales in each industry,



### Conclusion

To conclude, digital marketing is a sustainable and cost effective way to market services and products. It has been developing over the past decade and will continue to develop further as people start using it more. As a tool, digital marketing can be very beneficial to both industries and consumers as it helps form client relationships and it makes it easier to collect customer data. Marketing strategies have been put in place for companies to market their products better, which has also given birth to a new segment in the marketing industry. Both small-scale industries and large-scale industries use digital marketing in different ways, formulating strategies that work for them and altering them depending on the consumer taste.

### Acknowledgements

I would like to show my gratitude to MISA for organising this event and letting us expand our knowledge by researching and articulating this paper. I would also like thank my school, JNIS, and my guiding teachers, Ms. Neha and Ms. Manisha for supporting and helping me throughout my journey of writing this paper.



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### WHAT IS MILITARY COMMUNICATION AND HOW DOES IT EMPOWER THE DEFENCE SYSTEM OF A COUNTRY?

**Misha Sirnani**

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#### **Abstract**

Within this paper, we discover and come to a solid understanding of military communication and the empowering role it plays in supporting a country's defence system. It describes to us the duty and efficiency of the various forms and functions of military communication and how they each accomplish their common goal of passing on a message. Utilizing real-life examples, this paper outlines how due to rapidly improving technology, military communication has transformed over the years and that it is and always will be, a tremendously important part of any country's defence system.

**Keywords:-**The Defence System, Military communication and its functions, The forms of military communication, How military communications transformed over time, The importance of military communication

#### **Introduction**

Military communication is widely recognised as the 'transmission of information from reconnaissance and other units in contact with the enemy and the means for exercising command by the transmission of orders and instructions of commanders to their subordinates,' [1] In essence, it is comprised of all aspects of transmitting messages, or the conveyance of information by armed forces, on both land and sea. The main mission of military communication is to ensure that control and the chain of command is always maintained. It should also provide the communication of messages and signals to the forces at a proper time, concerning the threat of an enemy attack. The objective of this paper is to discuss the importance of military communication and to understand whether or not military communication is truly vital to the defence system.

#### **The Defence System**

The Defence System is known as 'the weaponry available for the defence of a region, including arms, implements of war and munitions.' [2] Worldwide, there are four main sectors of each and every defence system. These are known as:

- The Army. An Army is 'a large, organised body of armed personnel that fights primarily on land.'
- The Navy. A Navy is 'a branch of the military that operates at sea.'
- The Marine Corps. The Marine Corps performs both on land and sea and serves as a quick reaction force in order to respond to a crisis when it is necessary.
- The Air Force. An Air Force is 'a branch of the military which deals with aerial warfare.'



- The main purpose of the Defence System is to provide protection for its nation. It is a core element of the national security system and without it, the nation would be vulnerable to any form of attack.

### **The forms of military communication**

There are many communication systems in the military, and each of them has their own roles and advantages. Some of the forms of military communications consist of:

- Military Radio Systems. This is an important form of communication, since it allows armed forces to communicate directly with one another and to send each other urgent messages quickly.
- Cryptography. This is the study of turning messages into codes unreadable to anyone besides someone who is able to decrypt it. Codes are commonly used in the military to avoid information leaks and to stop important secrets from falling into the wrong hands.
- Alert Measurement Systems: These are systems designed to measure the various states of readiness for armed forces around the world. They can be used at many times such as, during an act of terrorism, or even during a state of war.
- Signal corps. This is a branch of the military which specialises in managing all the communications. Signals, such as, lights, flags and sirens are used in the military to communicate short commands and as warnings.
- Network-centric warfare- This is a theory of war that seeks to provide awareness of the battlefield and to translate an information advantage into a competitive advantage.

### **How military communication has developed over the years**

For as long as there have been militaries, military communications have been a constant part of all armies, ranging from olden times to the modern day. One of the most well known methods of early military communication was brought to life in the ancient Roman Empire. Now known as the first code writer in history, Julius Caesar was tired of having his foot-messengers ambushed and his secret communications stolen, he devised a simple cipher. Since every message had a letter count that made a perfect square, the key to decrypting his messages was to transcribe the text into a square grid and read it from top to bottom. To someone who didn't know how to do this, the message would be meaningless. This was the first time cryptography was used to communicate in the armed forces. Over time, this concept of rearranging letters was modified by others to make the codes more difficult to crack. In fact, during World War 2, the Nazis created a machine called the Enigma. This device shuffled clear text into seemingly senseless arrays of letters that could only be decrypted by another Enigma machine of the same calibration. From this example, we can see that as technology rapidly changed and improved through time, so did the methods of military communication. Initially, military communications were maintained through foot-messengers and simple signals such as fires or landmarks were used. Then, as technology progressed, in the mid 19<sup>th</sup> century, the electric telegraph was first used in the military. In the early 20<sup>th</sup> century, radios, radio telegraphs and telephone communications were adopted. Nowadays, at the peak of technology, various types of communications are used within the armed forces. Data transmission communications are carried on using radios. Messenger and postal communications are performed using vehicles including aeroplanes and helicopters and commodities such as rockets, lights, flags and sirens are used to create signals. [3]



### **The importance of military communication**

Communication is critical in the military. This is because a lack of communication would bring about disruption within the army due to the fact that important information and orders would not be passed down the chain of command. As a result, simple information would not be transmitted, missions would be misconstrued and most importantly, the lives of both soldiers and civilians would be in jeopardy. Without military communication, there would be disarray in the armed forces, as soldiers will not know what to do, where to be and when to be there.

### **Conclusion**

In conclusion, this paper has discovered that military communication empowers the Defence System through the transmission of information. The Defence System plays a predominant role in the protection of its nation, and if it were to fail, many countries would fall victim or become vulnerable to attacks. To prevent this from happening, we must consider military communication with the utmost importance because, 'the clear and concise exchange of information has always been vital to any successful military operation.' [4] Communication is truly at the heart of the military.

### **Acknowledgments**

I would like to take a moment to thank the MISA foundation for creating the incredible opportunity to participate in this competition. I am also eager to thank the esteemed teachers of Podar International School for giving me the chance to take part in this activity. Furthermore, I wish to thank my parents and my friends for all their advice and for always supporting me. Without you, none of this would have been possible.

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### COMPUTATIONAL MODELLING AND SIMULATION IN HEALTHCARE: A SUMMARY

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#### Abstract

Computational systems, modelling and simulations (CM&S) have been part of human history for about 50 years in the field of medicine. This study aimed to evaluate, analyse and synthesise its contributions in healthcare. The author compiled several field-specific publications, provided personal input and diluted complicated terminology, making it conceivable for the reader. The method implemented used the internet and certain online databases for the reading and citing. The results obtained were simple and most positive, depicting the irreplaceability of CM&S in healthcare. The author concludes CM&S has been and will continue to be vital the betterment of the medical field.

**Keywords:** Computational modeling and simulation (CM&S), Simulations in healthcare, Epidemiology, Modelling and Simulation During Pandemic, Literature Review

#### INTRODUCTION

As the fast-paced era of machinery progresses, making breakthroughs in and using technology becomes easier. This applies to the healthcare industry as well. A popular component in the history of medicine has been the art of modelling, which has developed leaps and bounds by contribution of computers. Computational modelling and simulation (CM&S) makes use of technology to demonstrate ideas, reveal gaps in knowledge sustained theoretically, or simply observe constructed scenarios. It uses mathematical and scientific explanations of naturally occurring phenomena to make them observable digitally. Some of the major types of simulations used in healthcare are: discrete event simulation (DES), system dynamics (SD) and agent-based simulation (ABS). Abiding with this paper's objective, the author will not be going into further details.

This paper talks about the history of computerised systems and how CM&S has given rise to the marginal development of the healthcare industry. As the paper unfolds, it moves from the past of CM&S and towards its significant work in the most recent pandemic, covering certain contributions and other examples.

A majority of the latest publications under this topic talk mainly about CM&S applied to very particular areas of medicine, e.g. making slit-lamp shields, exploring vaccine efficacy, studying transcranial simulation, etc. Some publications go into extreme detail, combining other published works, which may prove them unuseful to the novice reader with their complex terminology.



### METHODOLOGY

To gain a general understanding of the topic of computational systems, modelling and simulation, the author read various magazine articles and watched lectures available online.

However, due to the overwhelming volume of data present with questionable credibility, the author decided to view public access research papers from various trusted websites. The process of selection was fairly straightforward: The author first went to a database, e.g. PubMed Central, and used the search option. Keywords used included: 'Simulation and modelling', 'computational modelling and simulation', 'modelling and simulation in healthcare'. The following filters were applied to ensure maximum relevancy and availability: 'published from 2012 to 2022' and 'public access'. The second step of the process entailed reading the abstract to familiarise with the papers and pick ones appropriate for this research. For the final step, the author went for a full-text reading to scan for relevant material and quotations.

The information capturing for this paper meant identifying the notable inventions in each work and their uses. The dates of these inventions – or lack thereof, in which case another extensive search was required – were compiled and organised chronologically. This list of inventions is by no means exhaustive, and is only a compilation of ones that were taken note of by the author.

### RESULT

Pertaining to the collected data, the author determined that despite not having the most illustrious presence, CM&S played a significant role in the progress of medicine and medical equipment. Not only did it help in training medical staff in harmlessly, it also gave healthcare equipment manufacturers the opportunity to create and design tools to ensure utmost efficiency and effectiveness. The commonest forms of CM&S, i.e. DES, SD and ABS, have contributed to health-risk assessment, planning of healthcare services, public health policy evaluations and in several cases, training; thus, playing a drastic role in minimizing casualties caused by untrained staff. Simulations have allowed medical practitioners to refine surgical techniques with minimal experimentation on actual humans, while obtaining equally pertinent results. It has made a significant contribution in our recovery from the COVID-19 pandemic.

### DISCUSSION

The earliest computational model that promoted medical advancement is the First Generation of Stylised Phantoms created at Oak Ridge National Laboratory in the 1960s. Its application was to calculate the internal doses from nuclear medicine procedures, making it easier to figure out how much radioactive material was deposited in workers and patients alike.

As specific as the use was, it was the foundation for the better and ultimately more useful phantoms. These were called the Second Generation Voxel (Volumetric Pixel) Phantoms, produced in c.1980, which made use of voxels to recreate the 3D human body digitally.

While the phantoms progressed on their own, David Gaba et al. manufactured the Comprehensive Anesthesia Simulation Environment (CASE) at Stanford University in 1988. This simulation allowed medical students to practice anaesthetising patients with realistic human responses. This was a huge win, for a great number of deaths of the era were caused due to mistakes performed by practitioners with insufficient practice or experience.





The early 2000s introduced the third generation of phantoms, called Boundary Representation Phantoms (BREP). These were an immense improvement from the voxel phantoms, as they allowed formation of versatile bodies with a wide range of postures, organ shapes and organ volumes. Popular examples include the Polygonal Mesh-Based Phantoms still prevalent today, mainly assisting radiation dosimetry.

In relation to CASE: in 2007, medical schools developed internet-based systems that would allow their students to gain and improve the skills required for history-taking and clinical examination.

At University of Michigan, Alberto Figueroa et al, performed the first ever surgical procedure to entail computerised blood flow simulation, in 2015. This is considered a substantial step in the use of modelling and simulation for surgery.

With the SARS-CoV-2 virus outbreak in 2020, CM&S played a vital role in combating the pandemic. Popularly, computational models of the virus structure were created to spread awareness and eventually to develop vaccines. Other examples include the use of simulated systems to test vaccine roll-out strategies and using simulation to increase equipment effectiveness for medical practitioner safety.

Aside from what was aforementioned, the 21<sup>st</sup> century also saw an increase in the use of CM&S in the manufacturing of medical tools and equipment. For example, companies used product modelling to observe proposed pieces and assess them for post-market failures. This plays a role in decreasing the burden on patients and volunteers by minimising the need for the product to be tested on living humans, and in several cases, animals. It ensures that products are tested at least computationally before being launched for public use, e.g. stents, IVC filters, stent-grafts, etc.

### CONCLUSION

There were some limitations to this study: the lack of access to resources making it difficult to review a greater number of samples; and coming across paywalls and other barriers, interrupting research. This issue prompted the author to implement filters and directly ignore some resources. The filters applied may have led to certain important results going unnoticed. However, while this limits the generalisability of the results, it improves the relevancy of selected articles.

In the present study, the author examines multiple studies pertaining to various parts of healthcare. Significant difficulties of other publications included the surplus amount of detail and/or complexity. To overcome this, the author evaluated several documents, finding patterns and materials relevant to the untrained reader.

To conclude, this research finds that although not the most popular, CM&S has been a crucial contributor in the development of the healthcare industry. It has created potential for substantial progress of medical research and made room for practitioners to exceed human limitations in surgical procedures and other treatments.

For better understanding of the implications of these results, future studies should address the aforementioned limitations, and attempt to gather more resources, then examine them fully.

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### THE IMPORTANCE OF COMPUTATION, MODELING AND SIMULATION IN MEDICAL

**Preksha Jain**

Savitridevi Hariram Agarwal International School

#### Abstract

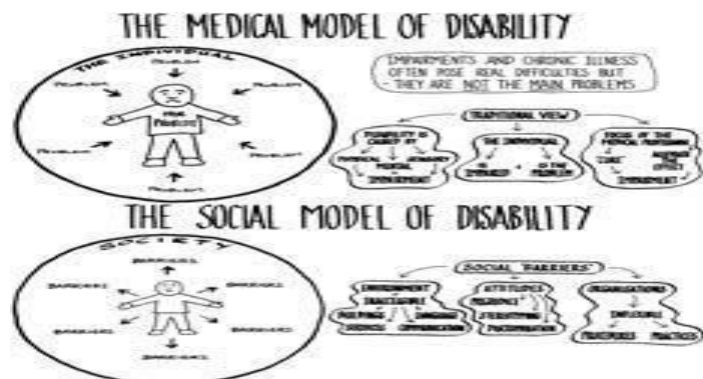
Computation, Modeling and Simulation refers to the procedure of erecting and operating computer-based mathematical problems in our daily routine. Simulation modelling in healthcare is the interrelationship between human-made and framework-oriented variables in complex systems of systems (SOS), and to explore scenarios of decision-making from different collaborators or practitioners.

#### HISTORY:-

**Simulation** - The history of computer simulation dates back to World War II when two mathematicians John Von Neumann and Stanislaw Ulam were faced with the puzzling problem of behaviour of neutrons. They introduced the game theory.

**Modeling** - Psychiatrist R.D. Laing coined the term “ medical model” in The Politics of the Family and Other Essays (1971). A medical model is a biopsychosocial model assessing a patient's problems, it shows the disease and it is detected and identified through a systematic process of observation, description, and differentiation, in accordance with standard accepted plans of action, such as medical examinations, tests, or a set of symptom descriptions.

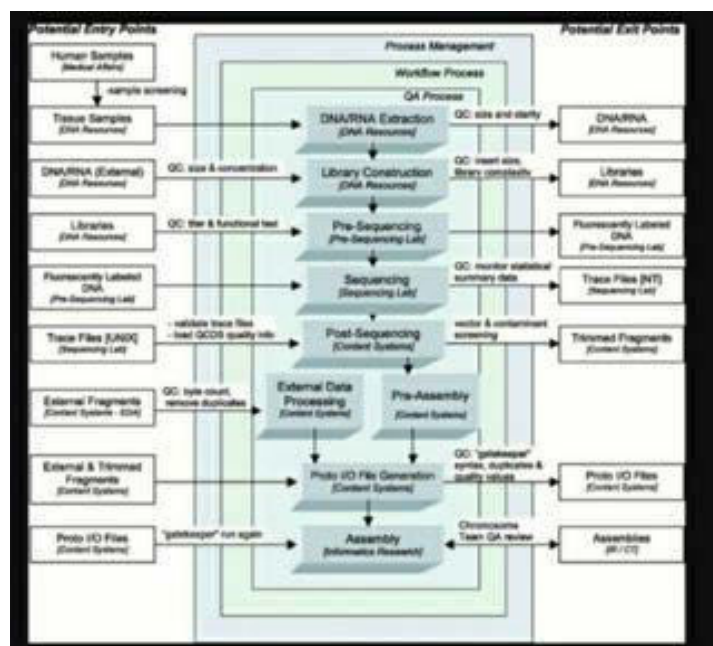
1- Image Medical model



**Computation** - Dr. Michael Waterman is known as the father of computational biology. In 1988, Dr. Michael Waterman and Eric Lander published a landmark paper describing a mathematical model for fingerprint mapping. His work formed one of the theoretical foundation for many

DNA mapping and sequencing projects, including the Human Genome Project, and has been used in some of the most commonly used tools in this medical field. Dr. Michael Waterman was a lecturer and his lectures were about the technologies and computational methods used to determine DNasequences of the genomes of organisms.

Image 2- *Sequence of Human Genome*

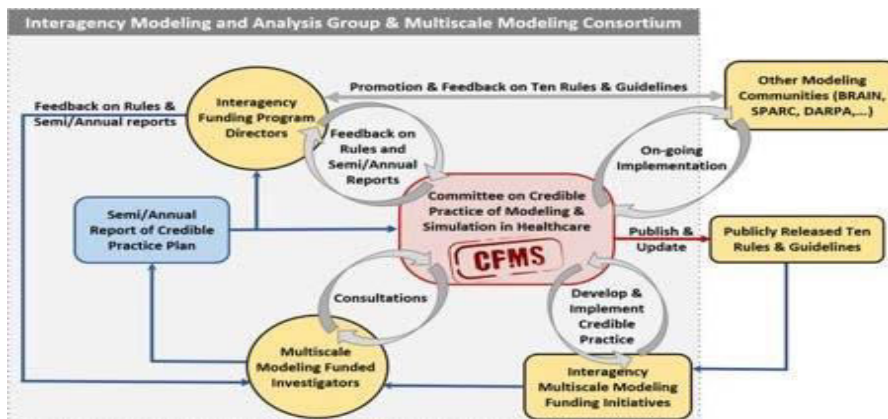


### Computational models :-

### Working:-

A computational model contains a number of variables that distinguishes the system being studied. Simulation is done by adjusting the variables alone or in groups and observing the outcomes. Simulation models consist of system entities, input variables, performance measures, and functional relationships. Data collected from these simulated experiments can be then used to identify which experiments can solve a particular problem. Computational modeling is used in many different scientific research including drug discovery, weather forecasting, flight simulation, and medical care research. Computer modeling allows scientists to conduct thousands of simulated experiments by computer.

Image 3- *Working*



### Features :-

- Time used in simulation is an indexing variable
- One of the main ways that we can save time in medical device development is through virtual prototyping
- It helps to perform a sensitivity analysis, helps to track complexity and identify the main design inputs that drive the critical result for the patient.
- It allows product development teams to run more scenarios than could be examined through the traditional methods of building prototypes and running physical tests.
- Computational, modeling and simulation consequences in making devices that are safer, more effective, more precise and with less risk.
- Provides new chances to medical device companies.
- The lower development cost also opens new markets that may not have been commercially viable in the past.
- Track transmissible diseases using Computed Tomography Scan (CT Scan), Magnetic Resonance Imaging (MRI), etc.
- Anticipating the adverse side-effect of drugs – Accurate data provided by modeling helps to develop safe and effective medications.
- Solve medical-related problems

### Types:- (Based on their functions)

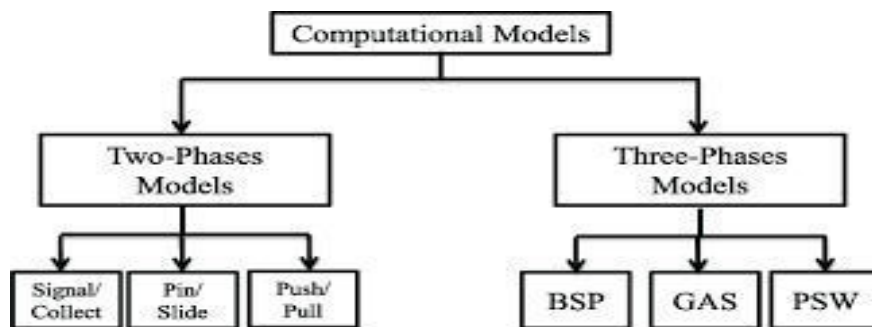
**Sequential Models :-** Sequential models a type of models in which healthcare consumption of services or supplies is seen as a sequences of consultations. They are the machine learning models that input or output sequences of data. Sequential data includes text streams, audio and video clips, time-series data and etc. Recurrent Neural Networks (RNN) is a popular

algorithm used in sequence models. Applications of Sequence Models. They are used for sequences like DNA sequences, Prognostic assessment of patients, sequential neural networks produce more accurate predictions for survival than standard neural networks, etc.

**Functional Models :-** Functional models are integrated models of healthcare which are an individualized, patient-led, science-based approach that asks how and why illness occurs and practitioners work together to address the underlying causes of disease and promote optimal wellness. They use a multi-disciplinary approach to treatment They focus on chronic conditions and alternative medicines or treatments. Examples of functional medicine are acupuncture, naturopathy, massage, chiropractic medicine, osteopathic medicine, body movement therapies, tai chi, and yoga.

**Concurrent Models :-** Concurrent models are also called as Parallel working models. Within this models the various activities of software development happen at the same time, for faster development and a better outcome. This model is applicable to all types of software development operations. It is simple for understanding and use. It gives immediate feedback from testing. It provides an precised picture of the current state of a project. The concurrent process model is often used as the prototype for the development of client/server applications. A client/server system is composed of a set of functional components. When applied to client/server, the concurrent process model defines activities in two dimensions a system dimension and component dimension.

**Types:- (Based on their phases)**



**Signal/Collect Model** - Signal/Collect programming model is that computations are executed on a graph, where the vertices are the computational units that interconnect by the means of signals that flow along the edges. All computations in the vertices are accomplished by collecting the incoming signals and then plotting the neighbours in the graph.

**Pin/Slide Model** – It is a model having a pin and a slide which are used in computational purposes.

**Push/Pull Model** – By name, it suggests that it is a model which is based on pushing and pulling which helps doing its work.



**BSP Model** - The bulk synchronous parallel (BSP) abstract computer is a bridging model for designing parallel algorithms. It is alike to the parallel random access machine (PRAM) model, but unlike PRAM, BSP does not take communication and synchronization for granted.

**GAS Model** – They are used for gas exchange in human lungs. It transports gas in the lungs by heterogeneous lung ventilation during the breath.

**PSW Model** - The program status word (PSW) is a register that performs the function of a status register and program counter, and sometimes more.

### COMPUTATIONAL BIOLOGY:-

Computational biology is a branch of biology that involves the applications of computers and computer science to the understanding and modeling of the structures and processes of life.

Computational biology involves the development and application of data-analytical and theoretical methods, mathematical modeling and computational simulation techniques to the study of biological, ecological, behavioural, and social systems. The field is broadly defined and includes foundations in biology, applied mathematics, statistics, biochemistry, chemistry, genetics, genomics, computer science, ecology, evolution, etc, but it is most commonly used as the intersection of computer science, biology, and big data. Bioinformatics began to develop in the early 1970s. A few years back, it was known for the science of analysing informatics processes of various biological systems but now it is all about research in artificial intelligence using networking models by the help of human brain in order to generate new algorithms. Biological data is used to develop other fields, biological researchers visit the idea by using computers to evaluate and compare large data sets. By 1982, information was being shared among researchers by using punch of cards. The amount of data being shared began to grow rapidly by the end of the 1980s. This required the development of new computational methods in order to quickly analyse and interpret relevant information. The Human Genome Project, began officially in 1990 and was technically completed by 2003. Since the late 1990s, computational biology has become an essential part of developing emerging technologies for the field of biology, leading to the development of a number of subfields. As of today, the International Society for Computational Biology (ISCB) recognizes 21 different Communities of Special Interest (COSIs), each of these represents a larger field of computational biology. In addition to helping sequence the human genome, computational biology has helped and continues to help create accurate models of the human brain, map the 3D structures of genomes and assist in modeling biological systems.

Computational biology is much vast and it is divided in several fields:-

- Anatomy - It focuses on the anatomical structures being imaged.
- Bioinformatics - Computational bioinformatics consists of developing and creating databases or other methods of storing, retrieving, and analysing biological data through various mathematical and computing algorithms. Usually, this process involves genetics and analysing genes.
- Biomodeling - Computational biomodeling aims to develop and use visual simulations in order to assess the complexity of biological systems.
- Ecology
- Evolutionary Biology



- Gene Ontology – It's about understanding how individual genes contribute to the biology of an organism at the molecular, cellular, and organism levels
- Genomics - Computational genomics is a field within genomics which studies the genomes of cells and organisms.
- 3D Genomics - 3D Genomics is a subsection in computational biology that focuses on the organization and interaction of genes within a Eukaryotic Cell.
- Mathematical Biology – It is a field that uses mathematical models, analyses, and representations of living organisms to examine the systems that govern structure, development, and behaviour of and within biological systems.
- Neuropsychiatry - Computational neuropsychiatry is the emerging field that uses mathematical and computer-assisted modeling of brain mechanisms involved in mental disorders.
- Neuroscience - It is the study of brain function in terms of the information processing properties of the structures that make up the nervous system.
- Oncology – It is also called as Cancer Computational Biology. It aims to determine the future mutations in cancer through an algorithmic approach to analysing data.
- Pharmacology – It is the study of the effects of genomic data to find links between specific genotypes and diseases and then screening drug data.
- Sequence Alignment – It is the process of comparing and detecting similarities between biological sequences or genes.
- Systems Biology – It consists of computing the interactions between various biological systems ranging from the cellular level to entire populations with the goal of discovering emergent properties.

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### A REVIEW OF CONTRIBUTION MADE BY COMPUTATIONAL SYSTEMS, MODELLING AND SIMULATION IN MEDICAL ADVANCEMENT

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#### Abstract

This paper analyses the procedures, advantages and weakness associated with the adoption of various contributions made by modern technology in medical advancements. The main contribution of this work lies in the data analysis of three paramount technologies viz. computational fluid dynamics modelling, Echopixel- 3-Dimensional Imaging and A Model of ClosedLoop Administration of Short Acting Vasoactive Agents. This study shall help opinion- formers to select the best criteria from these technologies while designing or evaluating newer ones.

**Keywords:** *Computational Fluid Dynamics, Vasoactive agents, Automatic care for critically-ill patients, 3-Dimensional imaging.*

#### INTRODUCTION

Computational technologies are surging in this era. The benefits of using technology involve the change in medicinal practices, a potential change in death rates and also paces the medical procedures. Due to this, technology in the healthcare industry has resulted in better patient diagnosis and treatment. Healthcare is perhaps the most significant area to benefit from technological adoption. As a result, the quality of life has improved throughout time, and many lives have been saved. Some of the contributions made to medical industry are computational fluid dynamics, Echopixel and a model of closedloop administration of short acting vasoactive agents. Computational fluid dynamics or CFD is a specialist area of mathematics and a branch of fluid mechanics.[1] It is used in the design of many safety-critical systems, including aircraft and vehicles, by solving differential equations to simulate fluid flow. [1] This software solves intricate and complicated geometries which would certainly not be solved by analytical solutions. As the software can simulate fluid flow it can certainly simulate flow of the particular fluid inside blood vessels in a human body. Therefore, it has a significant importance in the medical industry.

EchoPixel is the only intraoperative software in the market to enable contact- free immersive 3-Dimensional gross anatomical imaging, supporting structural cardiac intervention in laboratories, operating rooms, and hybrid operating rooms. The software was unveiled at the Transcatheter Cardiovascular Therapeutics (TCT) 2019 conference in San Francisco, the software renders in volumetric medical imaging information (DICOM Files) for doctors to practice on the simulation before they come for a surgery. [6] A model of closed loop administration of short acting vasoactive agents is a type of computational system which handles automatic care for



hypertensive patients. The technology executes nitroprusside infusions in patients' body to reduce blood pressure in the blood vessels. When an increase in the blood pressure is seen, the machine injects nitroprusside in the blood vessels to reduce the blood pressure. [3]

### Theory

Commercial CFD codes are often used to perform computational fluid dynamics. CFD codes are built on numerical techniques that address fluid-flow issues. To produce relevant information, all CFD codes must have three basic components: 1) a pre-processor, 2) a solver, and 3) a post-processor.[7] Pre-processing is indeed the process of entering a fluid flow issue into a CFD software. The solver's foundation is the estimate of uncertain flow variables using simple functions, the discretization of the estimates into the controlling flow, and the algebraic solution. The aim of a post-processor is to display the computational findings. Following this procedure, the researcher will be able to quickly comprehend the simulation findings. Changes in blood circulation profiles can be used to display pressure distribution, wall shear stress (WSS), and many more. Moreover, a cyclic movement can be seen during cardiac cycles. Medical studies have extensively developed simulation techniques to help forecast the pattern of cardiovascular blood circulation inside the human body. Computational simulations give essential information that is exceedingly difficult to collect experimentally, and this is one of several CFD sample applications in the biomedical field that may forecast blood flow through an aberrant artery. CFD analysis is increasingly being used to investigate fluid dynamics inside the human vascular system. Medical models of circulatory circulation have several advantages. They can reduce the likelihood of postoperative consequences, aid in the development of better surgical methods, provide a thorough knowledge of the underlying biological processes, and provide more efficient and less damaging medical apparatus such as

Blood pumps. CFD enhances experimental and analytical methodologies by providing a low-cost option for modelling actual fluid flow, notably in human bodily fluids. Despite its numerous benefits, the researcher must acknowledge limits of CFD. Because numerical mistakes arise during computations, there will be discrepancies between the computed results and reality. The most effective techniques to analyse the vast quantity of data created by numerical calculations are to visualise numerical solutions using vectors, contours, or animated videos of unsteady flow. Wonderfully brilliant colour images may add realism to the actual fluid dynamics inside a flow system, but they are useless if they are not mathematically correct. As a result, numerical findings must always be extensively investigated before being believed; as a result, a CFD user must learn how to correctly assess and make critical judgements about the calculated results. True3D software from EchoPixel allows heart surgeons to interact with medical images in the same manner they would be with physical real - world objects. It uses imagery from computed tomography (CT), magnetic resonance (MR), echocardiography, and C-arm fluoroscopy to generate life-size holographic models of organs, blood arteries, and other structures. This enables physicians to engage with a digital replica of the patient's anatomy to choose the best treatment target, approach, and catheter position while capturing exact measurements, distances, and angles. True3D has been found to facilitate the completion of procedures with predictable and reliable outcomes by providing greater visibility of anatomical features and spatial relationships. As a result, medical teams can better comprehend clinical difficulties and communicate more efficiently. Echopixel exhibits individual patients' anatomy in



accessible 3D space, allowing for quick response and flawless interaction. Procedure-specific anatomical information is freely accessible and unhindered. It offers the necessary visual context while excluding any extraneous information. It allows users to grasp, dissect, and size crucial clinical aspects in a single motion. It enables clinicians to generate and share rich data. Specialized for Echopixel are that it provides cross-sections in volumetric and 2D multi-planar reconstruction views, allowing clinicians to easily drive their view along any oblique aspect without being confined to axial, coronal, and sagittal views. It computes the surface area and volume of specified anatomy by employing lines, polylines, splines, orthogonal diameters, angles, and sophisticated tools that are appropriate for the patient's anatomy. It enables doctors to generate a 3D surface representation of their patients' anatomy and identify areas of interest. Centreline Extraction: This function finds the centre route of a 3D surface model. It allows you to focus on a specific area of interest and updates the image to display in all visualisation modes. Interpreting 3D anatomic linkages with current 2D and 2.5D perspectives presents new and distinct obstacles, which can result in procedural complications and inefficiencies, as well as impediments to expanding the use of non-invasive therapies. EchoPixel addresses such constraints by providing a 4D interactive holographic platform that helps real-time precise situational awareness of catheters and implanted devices in respect to complicated anatomy. A research regarding use of Echopixel was undertaken, the research included a retrospective review of 38 patients who underwent TAVI (entails inserting a catheter into a blood artery in the upper leg or chest and directing it to your aortic valve). [2] The EchoPixel system was used to calculate aortic annulus diameter. [2] The measured value was compared to actual valve implant size using t-tests. [2] Numerical data are presented as mean-standard error of the mean. The findings demonstrate concordance between EchoPixel aided and conventional approaches used for sizing TAVI devices. [2] EchoPixel could improve landmark detection, reducing procedure time and increasing accuracy. [2] 3-Dimensional visualisation may also be beneficial in more complicated instances including bicuspid aortic valve replacement and transcatheter mitral valve replacement. [2] Nitroprusside infusions help reduce hypertension in a patient, if during a surgery accidental punctures take place such vasoactive agents can reduce blood pressure to ease the blood flow until the lacerations is handled. Moreover, these infusions are regulated by computer. [3] The mean arterial pressure before therapy ranged from 134 to 165 mm Hg. [3] Nitroprusside infusion was started manually, a mean arterial pressure set point was chosen, and computer control was activated. [3] The computer compares mean arterial pressure to the predetermined point every 2 minutes. [3] The infusion rate rises by 5% for average vascular pressures 10 mm Hg or higher over the set point. [3] When mean arterial pressures fall 10 mm Hg or more below the set point, the rate of infusion is reduced or stopped, depending on the level of pressure. Excessive nitroprusside infusion induces perspiration, nausea, vomiting, agitation, restlessness, and muscular twitching; these symptoms decrease when the rate of infusion is reduced. Nitroprusside's hazardous effects are caused by its metabolism to cyanogen and cyanide, followed by detoxification to thiocyanate, however thiocyanate toxicity can also occur. Thiocyanate is primarily eliminated in the urine, having a half-life of around one week. Toxicity from cyanide and thiocyanate can result in metabolic acidosis, tachycardia, tachypnea, vomiting, headache, lethargy, nausea, anorexia, disorientation, and coma, and in severe cases, death.



### Results

The worldwide healthcare IT industry is anticipated to exceed \$441 billion by 2025. According to a recent Global Market Insights research. Innovative diagnostic technologies and software solutions are propelling the sector ahead at breakneck pace. These cutting-edge technologies and developments are not only saving lives, but also allowing people to live healthier, happier, and longer lives than ever before. As per a report from the Agency for Healthcare Research and Quality, avoidable deaths in U.S. hospitals have decreased by 17 percent since 2012, saving almost 50,000 lives.

### Discussion

The results indicate that computational systems, modelling and simulations in the medical industry has been a paramount addition. The contributions mentioned above have improved medical industry to such an extent that the industry has become semi-autonomous. Medical technology provide for the rapid and precise detection of health issues, allowing for prompt action and improved results. Innovative items may be used to replace, restore, and prolong malfunctioning body functions, while telemedicine and linked gadgets allow for remote monitoring of patients' ailments. These applications helps eliminating the manual labour present in the procedures, allowing humans to focus on more creative approaches and discovering newer technologies to further develop the race.

### Conclusion

The computational systems, modelling and simulations have improved healthcare throughout the globe from better diagnoses to better treatments and surgeries these modern technologies have made the world a better place to thrive in. The future of the health sector will drastically feature technologies that seamlessly integrate data on a patient's medical history, real-time health, health insurance, and financial details in order to enhance professional judgement, improve overall health, and save expenses. The first step will be to improve access to healthcare information.

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## THE FUTURE OF DIGITAL MARKETING AND ITS EFFECTS ON THE SUCCESS OF SMALL BUSINESSES

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### Abstract

The world is changing, and marketing is no exception to the world's move from analogue to digital. As the technology is developing the increase in the use of internet, search engines and social media has, had, and will continue to change the way companies carry out businesses and the way the customer's approach to it. The purpose of this research paper is to understand the future of digital marketing and the impact it makes on the success rate of small businesses. This research paper begins with a brief introduction of digital marketing, the importance of digital marketing, highlight some of the mediums of digital marketing, future of digital marketing and the success rate of small businesses in digital marketing.

### INTRODUCTION

The measures that a firm takes to promote the purchase of any products or services is called marketing. Marketing is used to find clients or consumers for the company's products or services. The promotion of any product or service in a digital format is called digital marketing. Digital marketing term was first coined in the 1990s. Digital marketing is also known as 'online marketing', 'internet marketing', or 'web marketing'. It is known as 'internet marketing' because with the rise of the internet there is also high growth of digital marketing<sup>1</sup> (Digital marketing). Marketing on cell phones, PCs, laptops, tablets, and other digital devices, for example. Digital marketing is a type of direct marketing that uses interactive technologies such as emails, websites, online forums and newsgroups, interactive television, and social medias to connect customers with the merchants electronically. The COVID-19 epidemic disrupted global economic order, but it also accelerated digital marketing efforts. In reality, many organisations were able to switch to remote labour and recognise the importance of digital marketing during the epidemic.

People are spending a growing amount of time online looking for information, discussing products and services with other customers, and interacting with businesses. Internet, social media, and search engines usage has become a part of everyday life for almost all the people around the world. According to data from January 2021, the internet is used by 4.66 billion people, or 59.5 % of the world's population every day<sup>2</sup> (Statistics 2021a). In 2020 there were 3.6 billion active social media users globally and there is an estimation for this to increase to 4.41 billion in 2025<sup>3</sup> (Statistics 2021b). There are more than 50 million businesses registered in Facebook and over 88% on the world's businesses in Twitter for their marketing purposes. Many small businesses have jumped headfirst into digital marketing in order to take first position. This has provided them with opportunities for wealth and expansion, and the influence of digital



marketing on small enterprises has been significant. The marketing plans that will be discussed in this research paper expands a company's customer base via the internet, which is crucial for a small business expansion strategy.

“Digital is at the core of everything in marketing today—it has gone from ‘one of the things marketing does’ to ‘THE thing that marketing does.’”

– Sanjay Dholakia, Former Chief Marketing Officer, Marketo

The main objective of this research paper which are brought together from several experts are:

- Understand the future of digital marketing
- The impact it makes on the success rate of small businesses now and in the future
- Various channels of digital marketing
- Importance of digital marketing

### Theory

The previous year's events revealed just how vital the internet has become in our everyday lives. When the globe unexpectedly moved from offline to online for the bulk of the year, it had a big impact on the future of digital marketing scene, we used to assume that the world had already been extensively digitised.

#### 1. Digital Marketing

A modern digital marketing is a vast network of channels into which marketers must simply integrate their brands; nevertheless, online advertising is far more sophisticated than the channels alone. Marketers must go deep into today's huge and complicated cross-channel world to identify methods that create an effect through engagement marketing in order to realise the actual potential of digital marketing. The approach of building meaningful relationships with new and returning clients based on the data you collect over time is known as engagement marketing. By engaging customers in a digital environment, you may increase brand recognition, establish yourself as an industry thought leader, and put your company in front of customers when they are ready to buy. Interactive digital marketing is regularly used to target certain client demographics. You can reach a broader audience with digital marketing than you could with traditional means, and you can target the prospects who are most likely to buy your product or service. It's also typically less expensive than traditional advertising, and it allows you to track results on a daily basis and pivot as needed.

When small firms initially begin, their first concern is usually how to get the first consumers. Traditional means of advertising, such as print ads, coupon mailers, and even outdoor advertising, may be used. Businesses may feel that since they provide an excellent product or service, customers would find their way to them eventually. While this technique may bring in a little amount of revenue, there is a better and more convenient way. Small firms should explore the global marketplace of online prospects and reap the benefits of combining traditional and digital marketing. No small business, no matter how inexperienced, should disregard digital channels as a source of leads and consumers.

Keywords: *Demographics- Demographic segmentation is a market segmentation approach in which the target market of an organisation is segmented based on demographic data such as age, gender, education, income, and so on.*

#### 2. Future of digital marketing



Digital marketing has become a way for many entrepreneurs and small enterprises to acquire a competitive advantage in the market. Small firms and entrepreneurs, on the other hand, must be open-minded to succeed in the new digital marketing era. Professional digital marketers predict that Gen Z and millennials will become "the" target demographic for most firms, necessitating a highly responsive and customised strategy. SEO, data analytics, and AI have become part of the digital marketing landscape. One of the examples of SEO strategy is voice search optimization such as Apple's Siri, Window's Cortana, Amazon's Alexa et cetera and has begun to play an important part in the search engine optimization (SEO) strategy of the company's organisation. This makes it one of the rising trends of the future of digital marketing <sup>4</sup>(Voice search). As AI advances, organisations will be able to automate more digital tasks, allowing them to make better business decisions based on data analytics insights. AR technologies are at the top of the list of digital solutions that make it simpler for small businesses to engage with their audiences. Many firms are already utilising augmented reality technology to propel their businesses forward in the next years.

Keywords: *SEO- SEO stands for "search engine optimization." In simple terms, it means the process of improving your site to increase its visibility when people search for products or services related to your business in Google, Bing, and other search engines* <sup>5</sup>(SEO).

The previous year's events revealed just how vital the internet has become in our everyday lives. When the globe unexpectedly moved from offline to online for the bulk of the year, it had a big impact on the future of digital marketing scene, we used to assume that the world had already been extensively digitised.

### Discussion

#### 1 Omni-channel Approach

Small businesses and entrepreneurs no longer must limit their online presence to a single Facebook page. As market expectations and customer demands expand, businesses should engage on a variety of digital channels and platforms. Omni-channel marketing is a method where businesses promote their products and services across all channels, devices, and platforms using unified messaging, cohesive visuals, and consistent collateral. Omni-channel marketing ensures you reach customers where they are with a relevant and on-brand offer <sup>6</sup>(Omnichannel). Customers' viewpoints and interests are used in omni-channel marketing to ensure that the company's marketing messages are consistent. For example, on Instagram and Facebook, you may just target those who have a certain interest and develop material for them. An omni-channel marketing approach employs the same language, imagery, and positioning statements across all channels, platforms, and devices. It guarantees that your brand is consistently presented across platforms, providing customers with a consistent brand experience. In the next years, businesses will be able to mix their core message and value offer for a specific target group across many media. An omnichannel approach requires that all distribution, promotion, and communication channels are linked. A contemporary supply chain — one that extends distribution over mobile applications, websites, social media, and retail — is the key to a seamless omnichannel experience. To get there, businesses must, break down boundaries between online and physical locations and manage product responsibility as a single marketplace just like the thing Best Buy did. They also require new technology, such as inventory management systems and new delivery methods. Marketers may gain useful insights into target audience behaviour while also





introducing new ways of engaging customers by employing an omnichannel digital marketing approach.

### 2 Influencer marketing

Influencer marketing is a sort of social media marketing that relies on product mentions and endorsements from influencers—people who have a large social following and are regarded as experts in their field for example PUMA uses many influencers for its marketing one of them being the famous Neymar Jr. himself and because social influencers have a high level of trust among their followers, their recommendations act as social proof to potential customers for the companies. The influencer often creates a platform or following by talking about it or generating material on certain themes or in a style that resonates with their followers. Despite the worldwide impact of Covid 19, the influencer marketing industry is still popular with businesses and marketers this year, and it is expected to grow even more. It has become a significant component of marketing strategy, as evidenced by several research. From \$1.7 billion in 2016, the influencer market was expected to grow to \$9.7 billion by 2020. It increased to \$13.8 billion in 2021, suggesting consistent growth. The sector is expected to grow to a massive \$16.4 billion this year and Influencer marketing related companies grew by 26% in 2021 to 18,900 worldwide.<sup>7</sup>(Stats1)



What happens when the 'normal appearance' of influencer marketing no longer stands out?

This question was answered by a famous American journalist Taylor Lorenz by quoting “While Millennial influencers hauled DSLR cameras to the beach and mastered photo shot, the generation younger than they are largely post directly from their mobile phones.” As a result, in order to be a fashion influencer among this younger group, you may no longer need to rely entirely on precisely staged photographs. Instead, relaxed stances with little retouching are becoming increasingly popular on the feed.



### RESULT DISCUSSION

#### 1. How does influencer marketing help small businesses?

Influencer marketing can help increase the awareness of the company which can lead to potential increase in the costumers. When consumers support your brand, the trust influencers develop with their followers convert into consumer action. According to LaunchMetrics' 2018 State of Influencer Marketing report, 90% of marketers agree that influencers help them increase brand awareness<sup>6</sup>(stats2). Using micro- influencers can also help small firms in there marketing. Someone with 1,000 to 100,000 followers is considered a micro-influencer. Because they specialise in a single or speciality subject, they are sometimes referred to as an industry expert or topic specialist. They're said to have more connections than the ordinary influencer. On average, micro-influencers with less than 1,000 followers generate an 8% engagement rate, compared to influencers with over 100,000 followers who average 1.7% engagement<sup>6</sup>(stats3).

#### 2 How can omni-channel help small businesses

Omni-channel can help the new or small businesses as it increases consumer trust, and people prefer to buy from companies they know and trust. As a result, your company draws more client retention and loyalty, delivers information on your customers' travel and behaviour as they progress through the sales funnel. With this knowledge, you can improve your performance and reduce the number of people who abandon their journey, instead of the sales and marketing teams working toward separate goals, the team works together for a shared aim. This method leads to an integrated marketing strategy execution, in which sales, marketing, customer support, and management all collaborate to achieve common goals and it enables accurate segmentation and customisation of your consumer base. If small companies use a unified omnichannel digital marketing strategy, they will be able to better understand their customers' changing behaviour, location, and preferences. More customer interaction means more leads and conversions, which means a greater ROI. But the availability to real-time, unified customer data is perhaps the most significant benefit of taking a platform approach to omnichannel marketing for small firms. Small firms may use business intelligence services, many of which are automated, to study how, when, and why customers interact with their brand.

*Keywords: Supply chain- A supply chain is a network between a company and its suppliers to produce and distribute a specific product or service.*

### CONCLUSION

It's hard to deny that the world is rapidly shifting from analogue to digital. Individuals are spending more money on online content, and businesses who are having difficulty incorporating this reality into their marketing plan must change swiftly. Individuals spend more time online each year, and the digital platforms they utilise become more crucial in their life and because clients may use digital platforms at any time and from anywhere in the world, businesses must transform their marketing approach from traditional to digital. When customer purchasing habits change, businesses must adapt their advertising approach and employ new marketing platforms. Large-scale quantitative investigations are required for this type of research. More



qualitative research is needed to analyse the different distinct marketing tactics that will be accessible in the future of digital marketing to assist small businesses grow more quickly.

### Acknowledgements

I would like to express my gratitude and appreciation towards my friends, family, acquaintances, and friends of friends who contributed to this research paper. I would also like to thank my school Ram Ratna International School and my principal Dr. Jaya Parekh, vice principal sir Mr. Manish Hegde for giving me a starting point for this endeavor.

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### IMPACT OF LEADERSHIP STYLES ON CREATING A HIGH-QUALITY WORK CULTURE

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#### Abstract

Leadership is crucial in achieving a company's objectives. This research looked at how leaders use situational leadership to help employees to perform better at work and how that helps the company in the long run. According to theory and research no single leadership style is best. Leaders that can adjust their approach to the circumstance and consider cues such as the type of task, the character of the group, and other things that may help to getting the job done are the most effective. The leadership styles undertaken are Authoritarian, Democratic, Laissez Fair and Situational.

**Keywords:** Leadership, Business performance, Leadership styles

#### INTRODUCTION

"Leadership is both a process and a property[1]," says Jago (1982, p. 315) when describing it. The process implies that an individual has the potential to mould the aims of a group or organisation and influence their behaviour. However, it is a collection of characteristics inside the leader in terms of property. Leadership style is defined by these features. A leader's leadership style is determined by the leader's ideology, personality, experience, and value system, as well as the type of followers and the organisational climate.

#### Theory

Authoritarian: Napoleon Bonaparte, the military leader of the French Revolution[2], is a fantastic illustration of this. He commanded a massive army while keeping his thoughts to himself and receiving little or no input from his subordinates. Clearly, his strategies were successful.

Laissez-faire: Warren Buffett[3] is well-known for his success, which he owes to his ability to surround himself with people he can trust and only intervene when necessary. Buffett is known for allowing people to make mistakes in order to learn from them. For newcomers, however, it was a challenging task with countless setbacks..

Democratic: Shri Chattrapati Shivaji Maharaj, has won the hearts of his followers. He was solely interested in the purity of involvement. Many times, the lower-ranking soldier made some novel proposals and numerous creative solutions, which were enthusiastically adopted and which helped this empire to expand rapidly.

However, the effectiveness of a leadership style is also determined by the quality of the leaders' impact. An effective leader should be practicing situational leadership will develop their talents in each type and be able to switch between them as needed.

Situational: The evacuation of a burning structure necessitates authoritative leadership. Choosing amongst various recommendations for an organization's social function demands

democratic leadership. Laissez-fair leadership is required to assist competent, experienced, and enthusiastic committee heads.

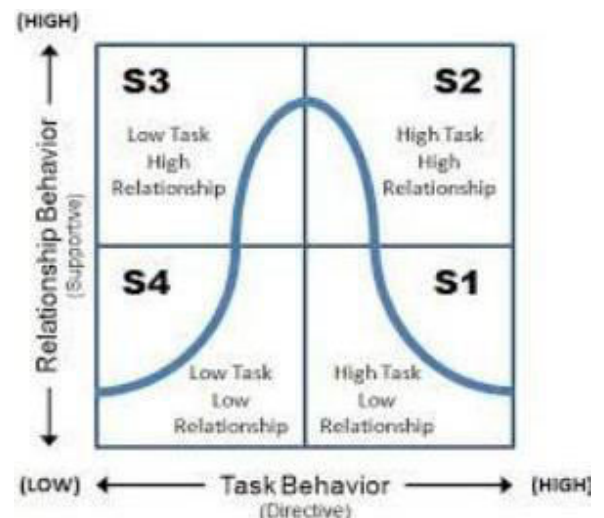
Bill Gates is a well-known businessman. Microsoft's driving force is a hybrid of authoritarian and democratic leadership styles[3]. He's a skilled delegator of work, but he also recognises the need of fully utilising his team members' abilities. The company's remarkable success was due to this blend of styles.

Also, Steve Jobs adopted this style, at first he use lassiez-faire to increase productivity among employees. The main goal was to get innovative ideas and design to increase sale. But eventually he face failures, thus this style was not working anymore. Moreover, Steve Jobs noticed and changed his style to autocratic. He directed his subordinates and regrow his business again. As the goals and situation change the styles changed simultaneously.

- Telling (S1): Autocratic style.
- Selling (S2): Situational style
- Participating (S3): Democratic style
- Delegating (S4): Laissez-faire style.

**Fig.1** speaks about Hersey and Blanchard theory[4] that suggests which leadership style is the most effective.

**Fig 1:** Leadership model



### Experimental

*Experiment 1:* "Does Hersey and Blanchard theory correct? Is it truly used in real-life by common individuals while handling organisations?", as a result of this thought, I attempted to interview Mr. Pradip Dhokale (AVP - Lead Retail Liability at HDFC Bank), he stated that he prefers more of democratic style than autocratic style because he believes that satisfied employees will work hard to achieve the organization's goals. However, when there is little time to finish a task or a problem that requires quick decision-making skills, autocratic is applied. This phrases provided me with the answers to the previous query, as he used blend of two different style to handle his follower, simultaneously the organisation.

*Experiment 2:* Trying to experiment, I, Arya Shrekar, conducted survey which had 6 different scenerios. In **Tabel 1**, each of the three possible solutions to each hurdle corresponds to one of three styles of leadership. The following link presents all of the survey's six questions: <https://itbwbq36lig.typeform.com/report/DJPMKJf1/uLVmZIV3xtI9Bjh6>

**Table 1:** suggests three possible solutions to each problem

Problem	Autocratic	Democratic	Laissez-faire
1	C	B	A
2	C	B	A
3	A	B	C
4	B	C	A
5	C	B	A
6	B	A	C



### Result

Link to all survey response:

<https://itbwbq36lig.typeform.com/report/DJPMKJf1/uLVmZIV3xtI9Bjh6>

Table 2: an example from the survey

Name	Grade	Problem 1	Problem 2	Problem 3	Problem 4	Problem 5	Problem 6
Nyansh	10	option C	option A.	option B	option B	option C	option C

If you look at the records in Tables 2 and 1, you'll note that he utilised different styles in different scenarios. For example, in Problem 1, he chose option C, indicating that he will handle it in an authoritarian manner. As, he may believed the group need guidance. Voting would be pointless, therefore he adopted an authoritarian approach. However, when it comes to Problem 2, he chose option A, and as a result, he will manage the situation with a laissez-faire style, the individual might thought , there is no problem. He utilised this method because he believed in the phrase "If it ain't broke, don't repair it!" Simultaneously, he adopted a democratic approach for Problem 3, an authoritarian method for Problems 4 and 5, and a lassiez-faire stylefor Problem 6.

### Discussion

Increased productivity and company loyalty can be a result of this sense of relevance. An effective leader will develop their skills at each style and learn to use all three styles when necessary. The purposes of this survey is to point out three leadership styles, to reflect a individual's tendencies in a specific situation, and to highlight the need for practicing "situational leadership". The goal of the study was to show that Hersey and Blanchard's theories are implemented by commoners.

### Conclusion

The only conclusion that can be drawn from theory and experiment is that anyone who tries or believes that handling situations can be done in a single style is incorrect. This paper focuses further on situational leadership, with an experiment to back up the theory. Not everything in this world is fixed; people must change as circumstances change. As a result, situational leadership is essential; the leader must be able to adapt to changing circumstances so that followers receive appropriate counsel, which will undoubtedly benefit the organisation.

### Acknowledgements

I would like to express my gratitude to my teachers-Mr. Pranay Sawant, Miss. Cynthia D'souza, and Mr. Sohan Dhuria, for providing me with this wonderful opportunity and assisting me through the project. MISA members also deserves credit for providing me with the opportunity to improve my research abilities. Mr. Pradip Dhokale (AVP at HDFC bank) and Reshma Salunkhe (Director of Onest Limited) are also to be thanked for for giving me guidance and knowledge about research topic .

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### IMPACT OF INTRODUCING MORE RELIABLE WEARABLE SENSORS IN HEALTH CARE MONITORING

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#### Abstract

This research paper has been written to access the level of Reliability provided by the Wearable Sensors in wellness programs. These tools are often used to track and record a variety of items for different purposes, ranging from monitoring personal hygiene to saving lives, some of which include:

1. Counting steps
2. Monitoring heartbeats
3. Measuring blood oxygen levels
4. Recording body temperatures

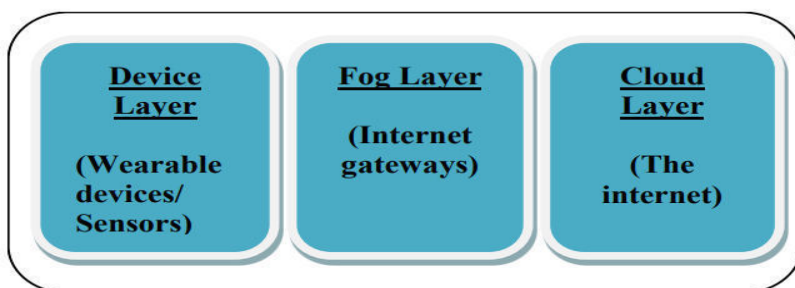
The paper also discusses how the future of these healthcare tools can bring about change in our society and how we can further improve it.

**Keywords:** *RHM (Remote Health Care Monitoring), IoMT (The Internet of Medical Things)*

#### INTRODUCTION

In recent years, hospitals have invested heavily in state-of-the-art medical technology to ensure the accuracy and reliability of medical equipment and the required level of efficiency. The Internet of Medical Things (IoMT) has played an important role in remote health care monitoring (RHM). IoMT is widely used to collect a patient's data remotely with the help of wearable sensors/devices and store them on a cloud server. IoMT has three main components:

1. device layer (body sensor network (BSN))
2. Fog layer
3. cloud service



**Figure 1.** The architecture of IoMT





The main purpose of the device layer (sensor layer) is to develop effective and accurate sensor technology for collecting different types of health-based data. Communication technology supports network solutions and IoMT system infrastructure. However, communication strategies include Bluetooth, RFID (NFC), WI-FI, IrDA, UWB, and ZIGBEE. In the cloud layer (in the data layer), the data is processed and stored. In addition, the clouds receive patient data for analysis, processing, and storage. Thus, data is available to caregivers. Table 1 shows wearable sensing technologies.

**Table 1.** Wearable Sensing Technologies

Wearable sensing technologies		
	Sensor type	Example
Line 1	Inertial sensor	Magnetic field sensors, Accelerometer, and Gyroscopes
Line 2	Location sensor	GIS and GPS
Line 3	Physiological sensor	Electrocardiogram (ECG), Electrooculography (EOG), Galvanic skin, and Spirometer
Line 4	Brain activity sensor	Electroencephalogram (EEG)
Line 5	Image sensor	Camera

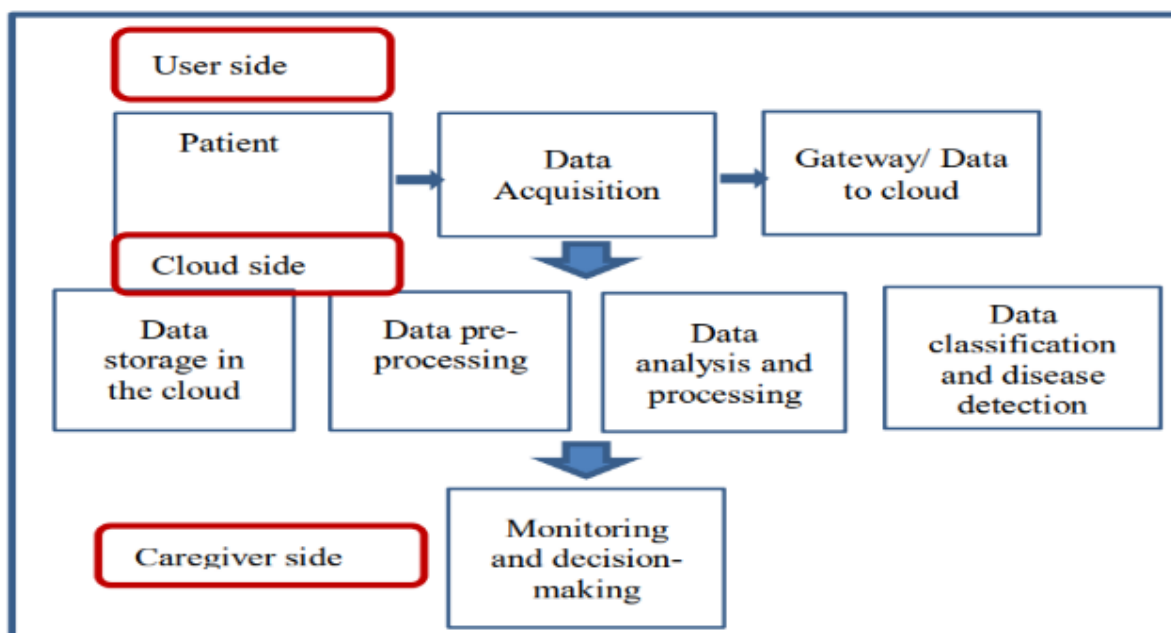
RHM is a continuous monitoring process of health data, this includes biological monitoring such as heart rate, temperature, and blood pressure, body function monitoring, diet monitoring, medication monitoring, and behavioral monitoring. Health-related data is transmitted wirelessly to both the patient and caregivers through a cloud. Thus, IoMT supports real-time, fast, remote, and reliable diagnoses of several types of diseases and improves the decision-making process. Through this process, large amounts of data are obtained, analyzed, and monitored.

With today's busy lifestyle, most people do not have a standard medical examination. In addition, healthcare costs are rising, and governments are spending more money each year on healthcare services. It is also noteworthy that according to the Indonesian Journal of Electrical Engineering and Computer Science, people in Europe and the United States prefer home-based care to attend hospitals. Therefore, there is an urgent need for remote health care monitoring in real-time to address all of these challenges. Continuous monitoring of patients and the elderly through the use of clothing and nerves has gained considerable attention.

The goal is to provide monitoring of important symptoms such as high blood pressure, temperature, and heart rate that are very important in today's world of health care. According to the World Health Organization (WHO), the number of patients with type 2 diabetes (T2D) is 422 million in 2014. That means 8.5% of adults have diabetes. However, the WHO expects that number will reach 500 million by 2030. Therefore, using RHM may reduce the risk for those most at risk by taking medical data and sending it to caregivers. RHM use includes the following:

1. Diseases management

2. Diseases prediction
3. Diseases prognosis
4. Diseases prevention
5. Diagnosing diseases
6. Giving the suitable medications and treatments
7. Rehabilitation



**Figure 2.** Proposed healthcare monitoring system

### Theory

The sophisticated growth of medical technology has greatly improved the health of individuals and society. Improvements have improved survival in the face of illness or injury and significantly improved patient quality of life through improved diagnostics and treatment outcomes. Managing goods and services is one of the key factors in ensuring the continuity of basic and supportive business activities in health care services. The delivery of community health care services is severely affected without the implementation of effective management. Medical assets are an important asset that contributes significantly to the efficiency and quality of health care services. Since medical equipment assists a wide range of resources in the health care sector, representatives of managers, such as medical engineers, must monitor and maintain assets by performing several maintenance tasks throughout the life cycle of the equipment.

Careful handling of medical equipment is essential to ensure that the machine operates under the manufacturer's specifications and ensures the safety of patients and users. Failure of medical equipment may affect the performance of health care services and may result in serious injury to patients and damage to the environment. Bahrain et al. it is summarized in the areas of governance, resources, information bank, service, assessment, education, and quality control. Performance testing is one of the most frequently performed tasks in the entire repair and maintenance phase to determine the true state of medical equipment.



Performing tests requires knowledge of the characteristics of medical equipment to produce the expected result. The expected outcome will assist health care managers or medical engineers in making important decisions about corrective management procedures to improve the reliability and availability of medical equipment. In addition, certain experimental studies in the Southeast Asian region, particularly in line with the Malaysian standard for managing medical device care, are still lacking. In constructing the current systematic review, the following research questions were discussed:

1. What are the significant parameters required on the medical equipment to be applied for the reliability assessment from the previous studies?
2. How do these parameters applicable to the Malaysian standard practices for managing the maintenance of medical equipment?

Selecting key parameters to be considered to assess the reliability of medical equipment is critical to ensuring quality health care services. In this study, the identification of these important parameters can be applied to a variety of medical devices used in any health facility. In addition, we provide an update on the feasibility of analyzing the reliability of medical equipment using artificial intelligence (AI) and/or machine learning (ML) methods based on these parameters across the health care cycle of the medical device. This research also leads to exposing the gap and youth. The identified parameters will have an impact on the comprehensive strategic management and maintenance of medical equipment, which includes three key components of preventive maintenance (PM), corrective repair (CM), and replacement system (RP). In addition, reliability testing using these parameters may complement and enhance the national standard of medical practice. Based on the research conducted, none of the included studies contributed to these three features and correlated the appropriate parameters and standards. Therefore, the study aimed to identify the essential parameters of medical equipment by conducting systematic reviews of previous studies related to the Malaysian standard of medical equipment repair management.

### Materials and Methods:

#### 1) Literature Search

Systematic literature reviews are conducted using published standards, which are PRISMA in evaluating and carefully analyzing articles related to medical equipment testing on the information. In addition, the procedures for inclusion and exclusion of current relevant studies are well documented. The included experimental studies are coded to achieve the purpose of systematic reviews in the study area.

#### 2) Resources

Research related to the testing of medical devices came from two main databases, namely the Web of Science and Scopus. The database covers more than 256 subject areas, including engineering and computer science courses that may enhance comprehension and essay skills. According to Younger, several established databases should be included to improve access to relevant articles in the study area. For this study, additional data selected were PubMed, Science Direct, IEEE Xplore, Emerald, Springer, Medline, and Dimensions.

#### 3) Article Selection



This section describes in detail the process of selecting articles. There are three steps to selecting suitable articles, namely, identification, testing, and eligibility.

#### 4) Identification

The identification and selection of appropriate subjects cover four key categories. First, keywords for title areas are identified. Thesaurus, encyclopedia, and previous research have focused on creating relevant keywords. Second, search series algorithms were developed from keywords in January 2020 based on the Science web and Scopus website information features, as shown in Table 2. Next, a few conditions for submission and release were determined to obtain articles from both information sites (See Table 3). These criteria are set because only the latest research articles in the topic area have been downloaded to reduce the chances of inclusion of an unimportant topic. Besides, only English articles were considered for ease of preparation. Later, these two search terms were used in advanced information search. As a result, 183 articles from the Web of Science and 505 articles from Scopus were returned. The same keywords were used in seven other sites, where 64 articles were identified. In addition, the identification of relevant subjects is done through other means, namely websites, organizations, and search quotes. By using the same keywords, 98 indexes were identified, therefore, 852 references contained articles and reports were obtained in the identification phase.

**Table 2.** The search strings for Web of Science and Scopus databases.

	Database	Search string
Line 1	Web of Science	TS = (("medical equipment*" OR "medical device*" OR "biomedical equipment*") AND ("performance" OR "reliability" OR "maintenance")) AND ("assessment" OR "predict*" OR "inspect*" OR "priorit*"))
Line 2	Scopus	TITLE-ABS-KEY (("medical equipment*" OR "medical device*" OR "biomedical equipment*") AND ("performance" OR "reliability" OR "maintenance")) AND ("assessment" OR "predict*" OR "inspect*" OR "priorit*"))

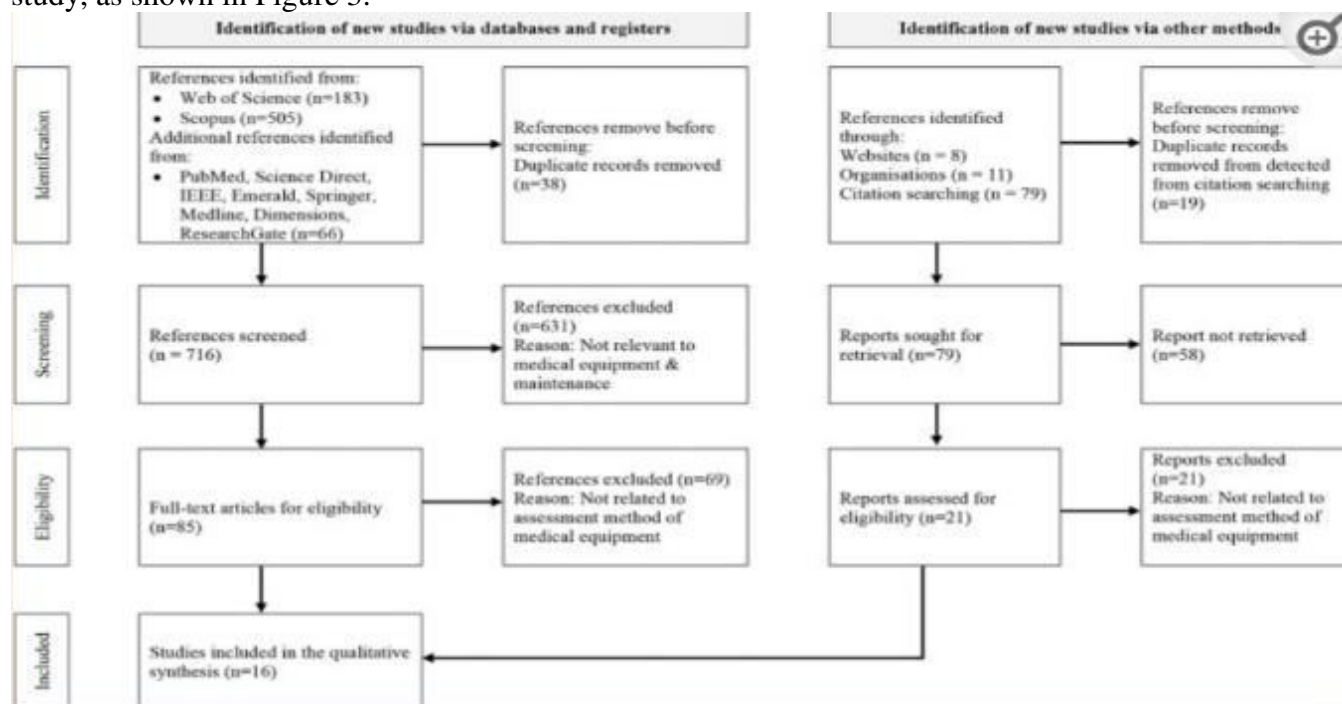
**Table 3.** The inclusion and exclusion criteria.

	Criterion	Eligibility	Exclusion
Line 1	Literature type	Journal (research articles)	Journal (review), book series, book, chapter in a book, conference proceeding
Line 2	Language	English	Non-English
Line 3	Timeline	Between 2000 and 2020	< 2000
Line 4	Subject area	Engineering, Computer Science, Medical Information, Operations and Management	Other than Engineering, Computer Science, Medical Information, Operations and Management



Examination 852 Articles and reports are divided into two sections to remove duplication and exclude unrelated subject areas or topics during the evaluation process. There were 38 and 19 duplicate articles in the database and alternatives, respectively. Therefore, these duplicate articles were removed, and the remaining 716 articles and 79 reports continued in the additional review process. Three factors were carefully tested during the test: title, keywords, and abstract. In addition, many considerations were considered in the evaluation of these three factors. First, the general terms of a medical device or medical device or other device included under these general terms are set out in the title and keywords. Second, an indication of the quantitative approach to evaluating the effectiveness of medical devices was presented in the abstract. Therefore, only 85 articles and 21 reports were selected for the next step.

**Eligibility** This step involves reviewing the full text of the essay to ensure that 85 research articles and 21 reports are eligible for compilation and review. The important content of the articles was thoroughly reviewed to ensure that the conditions for installation and removal were met. Important factors such as research objective, input parameters, methodology, expected outcome, and desired outcomes were carefully evaluated. Later, 69 articles and 21 reports were excluded due to the lack of a multidisciplinary approach to evaluating the effectiveness of medical devices and not experimental studies. In addition, two important articles based on manual search are included. Therefore, a total of the remaining 16 topics were included in this study, as shown in Figure 3.



**Figure 3.** PRISMA flow chart of the study adapted from Page et al

**Quality Checking and Data Release** A quality analysis method were used to evaluate the remaining articles. The first, second, and sixth authors conducted a quality assessment of selected articles. Articles are divided into upper, middle, and lower levels that reflect purpose, input parameters, performance, output, and desired results. The texts must be of the highest



quality and be agreed upon by all the authors. The compilation of extracted information was done by the first, second, and sixth authors and was compiled into an organized table. The third, fourth, and fifth authors then analyzed all the data included. Combined data was categorized using theme analysis. Following Active Medical Device Maintenance Management developed by the Department of Standards, Malaysia, the prescribed categories were associated with features. The result of the division of input elements was discussed intelligently among the authors. Any disagreements or disagreements were resolved amicably until the agreement of the reviewers.

### RESULT

As a large number of medical equipment and most of the functions are used in health facilities, the equipment will be properly monitored and maintained to maintain operational and safety standards. However, maintenance management can be challenging if a health care provider encounters a few problems with inadequate staffing and available resources, such as replacement parts and finances. According to the World Health Organization (WHO), initial costs, and operating costs are two categories of resources needed to maintain medical equipment. Cordova et al. added that the cost of care represents a large portion of the entire health system which requires 15-60% of the total operating costs. Improper care may affect performance and safety which has had a significant impact on spending on health facilities. Wu et al. proved that good maintenance management within 2 years improves the availability of medical equipment and reduces operating costs by more than \$ 1 million.

The computer invention program greatly assists health care management in managing care tools and services. Using the right method for large-scale data processing produces useful clues that can assist medical engineers in developing corrective planning strategies and continuous action. The identification of the process of medical equipment is important to produce important indicators. Based on the analysis from the included articles, conditional exemptions have been referred to in previous publications, data collection and output, expert judgment using survey, input based on customer needs, and adaptability to international norms and national guidelines.

### DISCUSSION

The first consideration that is important in improving the performance appraisal of medical equipment is to determine the appropriate input parameters. However, no single method can be used for all input parameters. The selection of input parameters must be the same and apply to the expected output. According to Mahfoud et al., the results of medical equipment tests are associated with care strategies. Availability of existing data that includes information on medical equipment and care history is one of the factors in selecting appropriate input parameters. Differences in the input parameters used can be processed to produce the same output.

The second consideration is a high-quality processing method based on thousands of medical equipment data. As mentioned earlier, many scientific methods are developed that can be used to calculate input data and ultimately produce the expected result for experimental purposes. However, the use of ML strategy is considered to be the best option compared to conventional strategies. This is due to the ability of the ML algorithm to assess the accuracy of high-output predictions using accurate and important input data.

The results obtained from the studies made by Badnjevic et al. And Kovacevic et al. Showed that the generated output achieved above 89% accuracy whereas Random Forest and Decision Tree



reached around 99% of accuracy in predicting both selected medical equipment performance. Therefore, both authors concluded that improved supervision, quality, and safety in managing medical equipment maintenance could be achieved which eventually optimized the cost of maintenance. However, the ML techniques utilized in both studies were developed based on only one type of medical equipment. Consideration of applying to various types of medical equipment would be more practical to be utilized in healthcare facility management. This is because various types of medical equipment have different functionality and required specific assessment to ensure their reliability being used in healthcare services.

### CONCLUSION

In the IoMT era, remote health care (RHM) monitoring represents the future of the health care industry. Importantly, to improve the quality of human life, the vital signs of the human body such as glucose levels can be detected. Worldwide, the number of diabetic patients is growing steadily leading to additional challenges in the health care community. Therefore, benefiting from the latest developments and trends in information and communication technology (i.e. IoT) is important. The proposed review study has compiled IoMT - remote health monitoring for diabetic patients. In addition, the challenges that go hand in hand with future styles are discussed and highlighted.

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### LEADERSHIP- THE CORE OF A BUSINESS

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Savitridevi Hariram Agarwal International School.

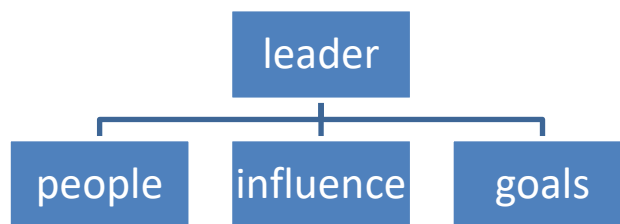
#### Abstract

In this advanced gen-z world, there is a major turnover of business mindset, from family businesses to newly emerging start-ups. With new start-ups, accompanies a ton of responsibilities, including learning new skills and strategies. Since leadership is regarded as the core of a business, this skill is of greater priority. After all, great leaders drive economic value. Individuals with great leadership skills empower teams to achieve their full potential, make wise decisions, and strategize well to help organizations thrive. However, leadership is the sum of many traits. In the upcoming sections, I will briefly explain the importance of leadership in business management, with advantages and disadvantages of the same.

**Keywords:-** *Managership*: controlling or administering an organization or a group *Influence*: to have an effect on the development, character or behavior of someone. *Leadership*: the action of leading a group towards a specific group goal.

#### INTRODUCTION

To understand the importance of leadership, we first need to look at its definition. “What does leadership mean?” The answer to this question is, Leadership occurs among PEOPLE, involves the use of INFLUENCE, and is used to attain group GOALS.



It is truly mentioned by George Terry, an American management author, “Leadership is the ability of influencing people to strive willingness for mutual objectives.” Leadership does not involve influencing your own behavior. There should be a minimum of 2 or more people present for leadership to take place. A well-known example of the same is a queen bee and a worker bee in a bee hive, in which the queen bee behaves like a leader, with the worker bees being the followers. Since the definition is now hopefully clear, in the further part, we will take a glance at the difference between leadership and managership.





### ]Theory

Since most people are confused between the meaning and features of leadership and managership, the following table will surely help.

Managership	Leadership
Dealing with or controlling things or people	Action of leading a group towards a particular common goal
Formal authority to influence behaviour	Informal authority (because of trust shown by group members)
Planning, organising, directing, staffing	Directing

To sum up, I would like to state that

**A MANAGER IS A LEADER BUT A LEADER IS NOT ALWAYS A MANAGER.**

The next topic which follows are leadership skills. Since leadership means organizing a group of people to reach desired goals, there are many skills required to do so. Below are some of the most important leadership skills that a great leader possesses

1. Communication skills  
 This is indeed the most important leadership skill of all. This not only inspires followers, but is also of great help to give feedback to the team.
2. Organizational skills  
 Organizational skills, which includes staying focused on tasks, and use your time, energy and mental capacity efficiently, are great helping hands for them to achieve their desired outcome and act as an example.
3. Interpersonal skill  
 Great leaders have to display emotional intelligence and make the team feel confident and motivated, to reduce chances of any conflicts or issues.
4. Problem-solving skills  
 Acting as a catalyst in a reaction, leaders have to find solutions to complex problems and situations. This enables to make successful decisions while abiding to the time period given.

### Experimental

The following social experiment will justify to the idea of importance of leadership.

To start with, we need to divide a group of 10 people into 2 teams (e.g. team A and team B). From the group A, appoint a person (with some leadership qualities), as the group leader. For team B, you don't need to appoint a leader, instead let the participants work as a whole team. Next, allot each group a series of same tasks with the same time limit (e.g. 7 days). After the deadline, ask for the completed work and record your results.

### RESULT

It is predicted and observed that the team with a group leader present (team A), successfully completed their target within the time period, whereas the team B, failed to complete the entire thing within a week. It also came to notice that group A did their work efficiently, with great



coordination, while group B found some difficulties with the unexpected problems that arose at the end.

### DISCUSSION

As we discussed in the earlier section, leadership skills are of great help, and this is also seen with the help of the experiment. In the following section we will take a quick glance at the 'importance of leadership in business management.'

#### 1. Better financial performance

The leader ensures that the team prioritizes business goals and successfully completes projects that add up to the company's financial performance. As we saw in the social experiment, with the leader, the team could pay attention to their goals and gain success easily.

#### 2. Improved customer retention rates

Retention rate is the percentage of existing customers who remain customers after a given period. Organizations that hire great leaders usually gain better retention rates, because leaders provide their teams with guidance and support that they need.

#### 3. Improved business agility

Agility means to move quickly and easily. Business agility can be increased with the help of experienced leaders since they remain calm and collected during adjustment periods and are willing to help their co-workers understand why and how the change is occurring. As we saw in the experiment the team B were stuck with some problems at the end, while the team A maintained their agility and were quite successful.

### CONCLUSION

To sum things up, I would like to say that, "Leadership is the art or process of influencing people so that they will strive willingly and enthusiastically towards the achievements of group goals." This process required various skills like communication, problem-solving and organizational skills, with the result being improved customer retention rates and better business agility.

### Acknowledgements

First of all, I would like to thank the MISA group for giving students like me the opportunity to pen down my ideas into paper. I would like to acknowledge my school and the teachers for their time and guidance. Last, but not the least, my near and dear ones for their support.

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### COMPUTATIONAL MEDICINE – MOVING FROM UNCERTAINTY TO PRECISION

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#### Abstract

Computational Medicine (CM) is an emerging discipline devoted to application of mathematics, engineering, and computational science to develop quantitative ways for understanding the processes, diagnosis, and treatment of human disease. CM's main goal is to create computational models of disease's molecular biology, physiology, and anatomy, and then use these models to improve patient care. Many fields of biology, including genetics, genomics, molecular networks, cellular and tissue physiology, organ systems, and whole-body pharmacology, can benefit from CM techniques. This paper introduces the concepts and characteristics of computational medicine and then reviews the relevance of the characteristics of computational medicine.

**Keywords:** *Computational medicine, Computational models, Diagnosis, Treatment*

#### INTRODUCTION

Medicine at its core, is decision-making in the face of uncertainty; decisions are made about which tests to undertake and which treatments to deliver. Traditionally, uncertainty in decision-making was addressed by individual physicians' knowledge and, more recently, systematic research appraisal in the form of evidence-based medicine. For a long time, the traditional technique has been employed successfully in medicine. However, due to the complexity of the human body and healthcare systems, it has significant limits. Complex systems are made up of a network of strongly connected components that are constantly interacting. These interactions provide redundancy and consequently failure resistance to those systems, as well as equifinality for many causation pathways to lead to the same result. Individualization of medical care, medicine, and medical decision-making is required by the equifinality of the complex systems of the human body and healthcare system.

Scientists can now discover, study, and compare the fundamental biological components and processes that regulate human diseases and their consequences thanks to powerful computational platforms. Traditional evidence-based medicine, which relies on personal testimony to guide testing and prescriptions, is a one-size-fits-all method that will eventually be supplanted with predictive, continuous, numerical health claims.

Improved patient outcomes are also aided by advances in modelling and simulation. The medical industry has been revolutionized by information technology in recent decades. The precision with which biological systems and interactions may be simulated and data collected



has increased by orders of magnitude. Computational medicine has supplied medical researchers with increasingly sophisticated data.

Computational medicine, in a nutshell, calculates and models the activity processes of organisms at the molecular, gene, cell, organ, and tissue levels at various time and space scales. This method may be used to get a more realistic understanding of the mechanics of life and illness, as well as a scientific and efficient strategy to enhance disease prediction, clinical diagnosis, treatment, and health maintenance. The objective is to enhance illness prediction, diagnose and treat patients more effectively, design, create curative effect assessments, engage in novel medication research and evaluation, and give "individualized" diagnosis and treatment. The intersection of computational medicine and artificial intelligence is a key avenue for clinical decision support system enhancement and development.

### Characteristics of computational medicine

Computational medicine is methodical and data-driven. In methodological and clinical research, computational medicine provides distinct benefits over traditional medical research methodologies.

- **Data Intensive**

Biomedical big data may be utilised to address difficult clinical problems and provide tailored health care services by mining new insights in the data and employing a data- and knowledge-driven fusion calculating approach.

- **Artificial intelligence**

In the biomedical discipline, the knowledge model is turned into a mathematical model. As input parameters, biomedical big data is employed. The model is iterated and trained using an artificial intelligence algorithm. To comprehend the nature of illness incidence, the output is near to the real-life system structure and functional features. Artificial intelligence can parameterize each patient's life data (including molecules, pictures, tissues, and organs) and create unique equations for them.

- **Systematic thinking**

The holistic theory of complexity science is employed as a method of thinking to explain "developing" new qualities in the interaction between molecules, cells, tissues, organs, and populations, as well as to capture disease occurrence mechanisms from a systematic viewpoint.

- **High performance computing**

In terms of size, biomedical big data has surpassed the petabyte mark. Data intensive scientific paradigms require significant computer resources and processing power to uncover new information. High-throughput, multi-task computing requires a high-performance computing environment that can handle data storage, computation precision, and computing speed.

### Advantages of Computational medicine over current system

Current System	Computational Medicine
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<p>The flaws of reductionism are becoming more apparent: the first is that the refining of distinct disciplinary branches is generating barriers to knowledge flow; the second is oversimplification. In the past, reductionist research approaches in medicine lost at least some information on interactions between different components of the life system, as well as non-linear aspects of the life system's structure and function along the time axis.</p>	<p>The varied activities of complex multi-level networks and the whole complex biological systems that coordinate these networks together are addressed in this medical field. From a systemic viewpoint, computational medicine uses the holism of systems science as the style of thought to capture the process of illness incidence and progression.</p>
<p>Clinical data is fragmentary and convoluted, and clinical diagnosis is based on clinicians' reasoning and judgement. When using traditional biological methods to analyze diseases, it is difficult to avoid error in</p>	<p>This medical discipline deals with the many activities of complex multi-level networks as well as the entire complex biological systems that coordinate these networks. Computational medicine, from a systems perspective,</p>
<p>Clinical diagnosis and treatment due to a lack of information extraction and the doctor level.</p>	<p>employs the holism of systems science as a way of thinking to capture the process of sickness onset and development.</p>
<p>Health and disease biology is extremely complicated. It entails the information flow from genes to proteins, networks, cells, tissues, organs, and organ systems.</p>	<p>Medical researchers may use computational models to better understand the nature of these exceedingly complex and perplexing diseases, as well as diagnose and assess the efficacy of various treatments. The results of the tests can be utilised to improve the model's predictability.</p>
<p>Precision medicine will use a knowledge network to deliver accurate disease prevention, diagnosis, treatment, and even health advice. However, correct integration of diverse highly connected biological, medical, and health information, as well as the construction of databases and accompanying decision support systems, are challenging to achieve in the short term. Precision medicine will be a tough procedure to enhance human health because of the complexity of the environment and disease.</p>	<p>We will look at life systematically, use computer-aided technology to build physiological and pathological models, use supercomputing to mine big biological data for new key points, and continuously optimize dynamic model construction by combining with artificial intelligence to explore the correlation in the whole-body system under the computational medicine methodology.</p>



### Computational models

Computational models aid in the understanding of these complicated interactions, which are frequently complex and non-intuitive in nature. Researchers may use models like this to better understand illness causes, help in diagnosis, and evaluate the efficacy of various medicines. The findings may then be used to direct further trials to collect fresh data and tweak the models until they are highly predictive.

- Advanced mathematical models are allowing researchers to better understand how networks of molecules are implicated in cancer and then use this knowledge to predict which patients are at risk of developing the disease.
- A discipline called computational physiological medicine is using computer models to look at how biological systems change over time from a healthy to an unhealthy state. This approach is being used to help develop better treatments for cancer, diabetes and heart disease.
- Computational anatomy uses medical images to detect changes, for example, in the shape of various structures in the brain. Researchers have found shape changes that appear to be associated with Alzheimer's disease and neuropsychiatric disorders, such as schizophrenia.
- Computational models of electrical activity in the heart are on their way to being used to guide doctors in preventing sudden cardiac death and in diagnosing and treating those at risk for it.

### Future Prospects

Computational anatomy, based on anatomical information and employing image processing, digital geometry, mathematical modelling, and virtual reality, is the first use of computational medicine in the clinic. It examines biological morphological variation quantitatively, human body structure modelling, surgical planning, stereotactic surgery, precision radiotherapy, image navigation surgery, robotic surgery, and the morphology and function of the nervous system. Computer-aided bioprinting microvessels, for example, have several uses in disease modelling and medication testing. Computational physiology, epidemiology, pharmacology, and other basic sciences, as well as fields with important program components, such as computational surgery, may take longer to incorporate operations based on computational medicine technology.

Computational medicine focuses on data models for operational prediction, whereas artificial intelligence relies on data information to rule summaries. Computer-based systems have their own benefits and complement one another. When computational medicine, artificial intelligence, and clinicians collaborate, a synergistic impact is created that is superior to each one or all of them alone, which will undoubtedly transform clinical decision-making.

The clinical diagnostic and treatment procedure will be optimized in the era of computational medicine. Clinical medical workers can focus on global clinical management, such as personalized drug side effect management, postoperative management, rehabilitation program management, emergency management, prognosis management, follow-up, and accurate definitions of individualized rehabilitation indicators, in addition to accurately guiding the implementation of treatment plans. The computational medicine model-building system provides a useful experimental simulation tool for future scientific study. This approach can personalize disease evolution models-Based on the needs of clinical medicine and scientific research, computational medicine should adhere to two research directions. One is to apply information science to life science and medical Research and adopt a data-driven learning method to



understand the mechanisms of diseases and explore new drug targets and treatment schemes; the other is to review the knowledge of professional fields comprehensively by establishing a man-machine interface and summarize and establish a knowledge model.

### Conclusion

The information age has arrived in modern civilization, and biomedical data in the medical industry has reached the Petabyte level. To break through the current "bottleneck," the biomedical field must speed up the construction of the new digital infrastructure that underpins computational medicine, emphasize the role of computational power, artificial intelligence methods, and big data, and utilize the value of biomedical big data. All associated practical computational medicine research is progressing quickly, however while computational medicine theory is potent, clinical applications are scarce. Although we are aware that the circumstances will soon change and that the implementation of this technology will become unavoidable, the question is not whether it will happen, but when.

### Acknowledgement

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## MODELING AND SIMULATION IN MEDICINE: ETHICAL TRADE-OFF BETWEEN EFFICIENCY AND CARE FOR ALL

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### Abstract

An appropriate understanding of the ethicality of modeling and simulation should now be regarded as an essential requirement in the field of medicine. Although a number of previous studies and research objectives have been conducted and published that assess the uses of modeling and simulation in medicine, the information has mainly been regarding the importance of modeling and simulation rather than the ethicality and efficiency of the topic. As such, a genuine view of the uncertainties of the uses of modeling and simulation as a whole may have not been obtained. To this end, this paper presents the ethicality of modeling and simulation in medicine as a whole based on research conducted on the same topic. The results obtained have been used to shed light on the general use of modeling and simulation in real-world scenarios.

**Keywords:** Modeling and Simulation, Ethics, Efficiency, Medical Practice, Distributive Justice, Care-for-all

### Introduction

We have been considering modeling and simulation quite advantageous since the age of digitalization first came into the picture. Since the intricacies rapidly increase in modern medicine, modeling and simulation have become more crucial. Why? We use modeling and simulation to comprehend and foresee the course of pathophysiology, disease origin, and illness spread. It helps predict issues and aids clinical and procedural findings to control impending problems. Due to this, unbecoming faith in the outputs of modeling and simulation will commonly end in impractical or unfavorable consequences. These consequences depict the necessity to regulate the implementation and transmission of modeling and simulation approaches and show the importance of formalizing them in this field. Specific scenarios illustrate how although proof is influential, it cannot create a holistic approach to medical practices. Evolution and reuse of the models change strategies by a significant interval, and modeling and simulation cannot graph that easily.

### Theory

In traditional engineering fields, computational modeling has been used for quite a period to sustain yield evolution and expansion. On the other hand, in biomedicine, modeling and simulation approaches haven't been accepted as efficiently. Engineering is a historically robust mathematical framework where modeling has been used by assuming and understanding the first principles and human-made procedures with internationally accepted parameters. Biomedicine





has complicated systems with contrasting elements that professionals have to reverse engineer without a complete understanding of the properties of functions of the components. Without maximum control over the disease, it's virtually impossible for modeling and simulation to track the progress of the illness. Medical practitioners face challenges in being assured of the model's results due to the lack of knowledge that the model needs to create functional results. The installation of trust in biomedical simulations is exceptionally demanding. Why? The initiation of faith in biomedical simulations is quite difficult to muster. Why? Because direct measures are challenging to conjure because the simulations cover specific spatial and material scales.

Think of the Rajagopal example. It shows how a variety of sources can cause constraints. Components (cellular types, anatomy, signaling pathways), model simplifications (2-D vs. 3-D), parameter values (copying data values from different organisms), and other decisions influence the credibility of models. Due to this, it inhibits our proficiency to demonstrate precision, which leads to uncertainty which inhibits care-for-all. If everyone cannot be cared for equally, the ethicality of modeling and engineering is in question. The efficiency would increase in the similar qualities of each patient and individual, but the differences could lead to a greater plague in the issues caused by these diseases.

### Result

Central roles, played by computer modeling and simulation along with graphing methods, in changing how we use medicine as a cure need to be easy to trust, but currently, they are not faithful. We use these methods in educational training, skill development, tests for new vaccines and cures, supporting figures for decision-making, and as a way to investigate unfamiliar issues in our current world. Knowing this, how can we confirm ethicality and efficiency in the medicinal uses of computer modeling and simulation, especially when every individual is different?

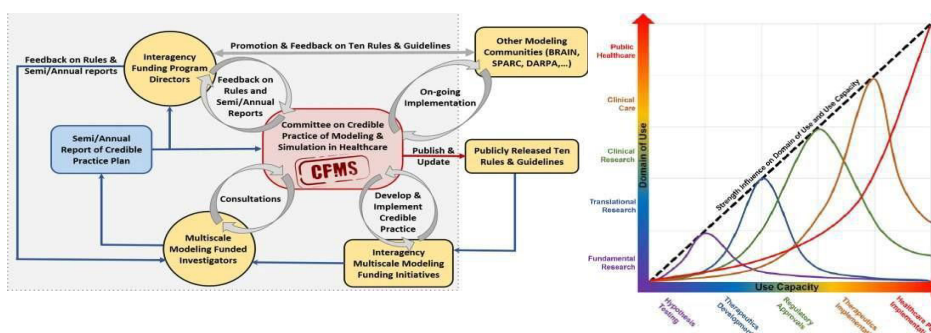
**Educational training:** By installing realistic simulations with surprise complications during surgeries or problematic incidents during certain parts of research about different diseases, the students can have a chance to use their understanding and problem-solving skills to solve unexpected problems. The addition of graphical representations can help the learners understand estimations about different disease continuations.

**Tests and trials:** We should not exhaustively depend on graphical representations. We should contact several other medical professionals before beginning trials based on previously conducted tests.

**Graphical figures:** We should not exhaustively depend on these figures without considering all differences within each case and should study each of these separate cases before we develop an outcome. Investigation purposes: (same as 1, 2, 3, 4) We should study each disease thoroughly before deciding on any hypothesis or experiment.

### Discussion

Medicine, implementing such fixations is difficult, but it still needs to be done. The charts below show verified possibilities of installing modeling and simulations safely, ethically, and effectively. By using Fig. 1, and developing the CFMS system, we can make sure that medical professionals can develop proper systems to use modeling and simulation for different diseases. Fig. 2 shows how different domains should implement modeling and simulation so that it is used ethically and efficiently.



### Conclusion

The research on the ethics of modeling and simulation is not thorough, especially within public health. The internet technology methods can be considered a blind spot. In this paper, I showed that ethical consequences arise in any new case, and we should take moral standpoints to find a correct solution. A question arises: how? In simple words, each case, disease, graph, simulation, and complication should be studied extensively before medical professionals come to any Conclusion- Along with that, hypotheses should follow the four/five phases of medical trials, so that we can prevent any issues from arising. As Daniels has stated, “we protect equal opportunity best by reducing and equalizing the risk of these conditions arising.” This is how we can use modeling and simulation ethically and effectively.

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### METHODS ABOUT HOW ACARS MINIMIZED OVERSIGHT WHILST ARIEL

**Ronil Chokshi**

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#### **Abstract**

This paper is written with the focus of probing how Aircraft Communication Addressing Report System (ACARS) has helped reduce the human error caused while communicating while airborne and also helped enhance the data integrity of the aircraft. This paper also looks into the basic uses of ACARS and how the communication is established to the ground. It will also look at how the communication has been developed and bettered over time

**Keywords:** ACARS (*Aircraft Communication Addressing Report System*), VHF (*Very High Frequency*), HF (*High Frequency*), ITU (*International Telecommunication Union*), EICAS (*Engine Indicating and Crew Alerting System*)

#### **INTRODUCTION**

What is ACARS? It is a protocol designed by ARINC, a company which revolutionized airborne communication. ACARS provides a digital telecommunication link over which data can be transmitted (data link). It is used to consign specific data, like altitude, system status and diversion information. Before ACARS' establishment for communication about aircraft status, route changes, and so forth, analogue voice communication was used on either HF (High Frequency) or VHF (Very High Frequency) radio waves, and this had its own set of problems, such as, miss pronunciation of words by non-native English speakers, debased audio quality as the signal travels a long distance, and possible audio lag. These are some of the problems of voice predicated communication. Nevertheless, it is still the primary mode of communication for exchange of basic data. On the other hand, since the introduction of data based communication in the 1980s, the communication between the ground and the aircrafts has become much more potent, as the problems listed above are avoided and the process of how that is done is listed further in this paper.

#### **Theory**

When it comes to communication while airborne, there are many methods to do so. In the start just after the Wright Brothers made flight possible on December 17, 1903, the most leading methods of communication to the aircraft, in those times, was visual communication, coloured flags, hand signs, flare guns, and with the development of wireless telegraphy, even morse code. But this was a problem at the time, the reason being, only the morse code method was the one that supported 2 way communication, i.e. from pilot to ground and vice versa. After further development, radio communication came to light, its very first tests were performed in Brooklands, England in June, 1915 [3].



Analogue voice communication or radio communication, as stated in the introduction, uses a certain set of frequencies which are unique to each country. These certain set of frequencies are allocated by the International Telecommunication Union (ITU). The ITU has divided the radio spectrum into 12 different bands. However, the ITU has allocated band numbers 7 and 8 for civil aviation, i.e. HF (3-30 MHz) and VHF (30-300 MHz) respectively. They have sub sets in these frequencies which are allocated for different purposes like communication, surveillance, and navigation. Aircrafts usually communicate using the VHF band, the main reason being VHF communicates with towers that are in line-of-sight and the sound quality is much better than that of HF, but it has its own drawbacks, one of them being, it is of no use when long range communication is needed as it cannot penetrate through obstacles like buildings or mountains. HF on the other hand is used for long range communication, since it has the ability to penetrate through these said obstacles, as for the reason as to why it is used for long range communication, it is because it can reflect off the ionosphere with the help of the free electrons. The waves hit the free electrons, which hence causes the electrons to vibrate and re-radiate the energy back down to the ground stations at the same frequency. Its only drawback is that the quality of the communication is very poor, which hence makes it difficult to understand those who are non-native English speakers [4].

But nowadays ACARS is used, for text based communication with other aircrafts, Air Traffic Control (ATC), and/or Airline Operations Control Centre (AOCC). It makes the use of the VHF data link (VDL), HF data link (HDL), and/or SATCOM (Satellite communication) using the Minimum-Shift Keying modulation (MSK) to send data collected from the aircraft's sensors like aircraft position or weather patterns to different stations on the ground. It automatically finds the most suitable and reliable channel of communication if there is a choice, which therefore helps reduce the crew workload and helps in critical times [1] [5].

Additionally, a Datalink Service Provider (DSP) is to oversee the transmission of these messages. The main DSPs are AIRINC and SITA, with AIRINC being the creators of the ACARS protocol. However, the DSPs can't directly route the messages, they must have the permission/contract from the Air Navigation Service Provider (ANSP) or the Aircraft Operator. Aircraft operators have the ability to often contract out the function to either DSP or any other separate service provider.

One of ACARS' extremely useful features is automatically sending the messages to their respective ground stations, it does this by pre configuring the messages to their message type [5].

There are 3 types of ACARS messages, Air Traffic Control (ATC), Aeronautical Operational Control (AOC), and Airline Administrative Control (AAC) and their configuration is done based upon their contents. ATC messages include Pre Departure Clearances (PDC) and Oceanic Clearances (OCX). They are usually used throughout the duration of the flight, as OCX requires that pilots ask for the clearance approximately 40 minutes before entering an oceanic entry point. Similarly, AOC messages are also used throughout the duration of the flight, they are used to automatically report the engine status to the airline maintenance department to see if it is working properly. Reporting the flight times and receiving the load sheet, which states the distribution of mass and the balance condition throughout the aircraft to determine if the balance limits of the aircraft are exceeded or not, is all done by the AOC messages. These type of messages have helped save numerous lives as any problem with the equipment can be known beforehand which can help prevent any possible catastrophes. The next type of messages are



AAC messages, they provide admin information to the pilots such as Passenger Information List (PIL) which has information about the passengers and available seats etc [2] [5].

Coming to how ACARS helps forestall tragedies, it is managed and monitored by the crew in the cockpit. This is done by the help of the Control and Display Unit (CDU). This is the only unit that's provides and interface to manage the data transmitted and received. The CDU is a unit used to access the Flight Management Computer (FMC) which is connected to the Engine Indicating and Crew Alerting System (EICAS) which is used to alert the cabin crew in the event of failure or malfunction of any electronic device onboard the aircraft [7]. Furthermore, the CDU is also used for text based communications with other aircrafts and to ground control, it accomplishes this with the help of Communication Management Unit (CMU) and VDL, HDL, and/or SATCOM and a printer [6].

Given ACARS' ability of automatically reporting engine failures, change in pressurization, and hydraulics etc. it could possibly help allay the damages or give out an early Mayday call. It also played an important role in the endeavor to locate the aircraft Malaysian Airline 370 to an approximate location, it could achieve this because of the secondary ACARS system onboard the aircraft. The secondary system kept on attempting to ping one of the fourteen Inmarsat geostationary telecommunication satellites [8]. Furthermore, it also played a cardinal role in indicating the faults in the cockpit temperature sensors and the activation of the optical smoke detectors because of the pilot's habits of smoking in the cockpit on an EgyptAir flight MS804 before the aircraft crashed into the Mediterranean Sea on May 19, 2016 [9].

### CONCLUSION

In conclusion, although there aren't many facts and incidents about how ACARS saved the day, it is undeniably one of the most useful systems in the aircraft. This protocol was easily one of the biggest breakthroughs of the 20<sup>th</sup> century as it enabled pilots to better communicate with the ground and ameliorated data integrity and accuracy. However, it has a couple of drawbacks. It has problems of data privacy. Since ACARS uses the VHF channels as a mode of communication and since these are line of sight channels, there is a chance that the data can be intercepted by unauthorized personals. Additionally, the data isn't encrypted so it may directly give out the possible position and condition of the aircraft. On the contrary, weighing the drawbacks and the benefits, it is safe to postulate that ACARS has helped refine the safety of an aircraft and its passengers to a prodigious extent.

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## IMPROVISED HIGH FREQUENCY TECHNOLOGIES IN MILITARY COMMUNICATION

**Sparsh Choudhary**

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### Abstract

With High Frequency communication reaching its renaissance worldwide, newer and more improvised technologies emerge, and this research paper aims to bring to light the uses of High Frequency communication technologies in empowering defenses of a country and certain theoretical/practical problems along with it.

**Keywords:** *High frequency, electromagnetic wave propagation, ionosphere, communication, electromagnetic spectrum, Wideband HF, NVIS Principles*

### INTRODUCTION

It is common knowledge that the key behind almost every success is communication and this fact does not change even in fields like the military. The military, has a lot of use for communication as it holds the military together. And an effective way of communication is needed among the personnel.

Currently, military systems all around the world use High Frequency signal propagation to communicate. High Frequency signal has 3 types of propagation methods and all have their own uses and drawbacks which I would like to state and try to assess.

1. Line of Sight (LOS)
2. Groundwave
3. Skywave (BLOS)

#### 1.Line of Sight

Also known as direct wave, the signal in LOS propagate in straight lines between the transmitter and receiver and is the only most consistent HF propagation method. This is because the ability to communicate will not change when communicating between a pair of transmitter and receiver at a given location with the signals propagating in a straight line.

#### Fig.1 Line of Sight propagation

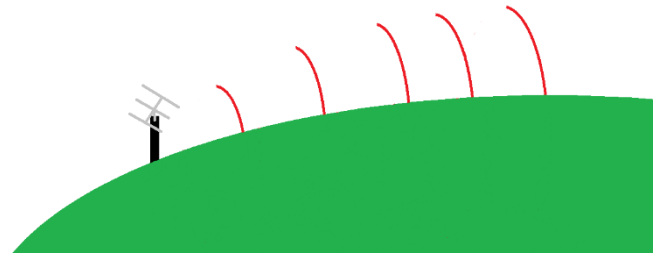
LOS propagation is rarely ever used for HF frequencies. This is because, HF's have a rather lower frequency so we would require large antennae and available bandwidth for HF communication is limited. Because of this Line-of-Sight communication is mainly used with Very High Frequency or VHF





### 2. Groundwave

Groundwave, also known as surface wave, is a propagation method that uses the conductivity of the Earth's surface for communicating between transmitter and receiver. This communication technique can be used when there are no direct receivers and transmitters in a straight line of sight. **Fig.2** Groundwave propagation



This technique works by the interaction between the lower part of a signal's wavefront and Earth's surface that causes the signal waves to tilt forward and allow the signal to follow the earth's curvature well beyond line of sight.

The efficiency of this method depends on two factors: the surface conductivity and the frequency of a transmitted wave.

The ground conductivity is a measure of how conductive the soil/ground around a transmitter is, in context to a wave. This generally depends on the type of ground, with cities and Polar Regions being the least conductive, hills and forests with loamy soil having a moderate conductivity and sea water (high salt content) having the most conductivity.

In general, higher ground conductivity yields better results i.e., the signal travels a greater distance. Compared to rocky dry land, salt water has a high conductivity. So, groundwave communication can be used between ships and shores.

Soil description	Ground quality	$\sigma$ (s/m)	$\epsilon_r$
Cities, industrial areas	Very poor	0.001	5
Sandy, dry, flat, coastal	Poor	0.002	10
Rocky soil, steep hills, typically mountainous	Poor	0.002	13
Pastoral, medium hills, forestation, heavy clay soils	Good/average	0.005	13
Pastoral, low hills, rich soil	Very good	0.0303	20
Salt water	Excellent	0.5	81

**Table.1** Ground types as used by L.B. Cebik, W4RNL.

As mentioned earlier, groundwave depends on frequencies as well. Groundwave works best with lower frequencies. This means that, in a transmitter with a set power input, it will transmit signals by groundwave propagation farther in a low frequency than high frequency.

### 3. Skywave

Skywave is the most common and also the most effective method of signal propagation. It allows for global communication techniques. It works by using the ionized particles in the upper atmosphere of the Earth. These particles are collectively known as the ionosphere. The ionosphere refracts the HF signals coming towards it back to the Earth and depends on the electron density of the ionosphere. This enables communication between transmitters and receivers that are thousands of kilometers apart.

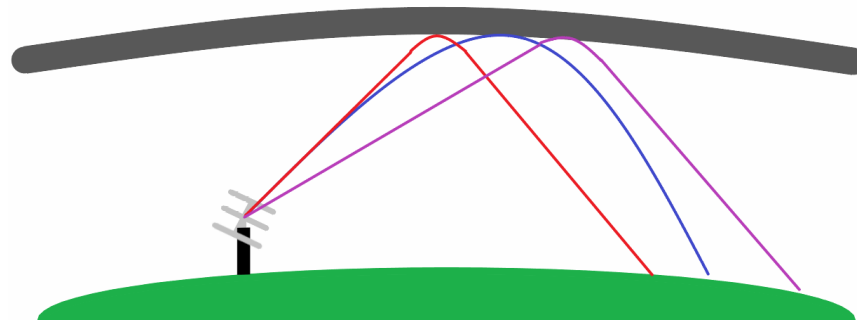


Fig.3

### Skywave Propagation

This technique is dependent on altitudes and the density of the different layers of the ionosphere. The state of an ionosphere is affected by the sun. The ionosphere is formed when the rays of the sun strike gas molecules in the atmosphere, this detaches an electron from the molecule and forms a positive ion and a free electron that helps in HF propagation. The free electrons are held in the Earth's atmosphere by magnetic field of the earth.

### The layers in an ionosphere

The ionosphere lies above the stratosphere and has different densities of ionization. This depends on the altitude of a particular place. Areas with a certain level of ionization are grouped into layers.

The layers which are most important for skywave propagation are the D-layer; the E-layer; and the F-layers, F1 and F2. The altitudes of these layers aren't certain because the density and the altitude of a given layer is not always constant and may change over time. However, the density and the altitude can be predicted. These layers are standardized because of the difference in which they refract/absorb HF signals.

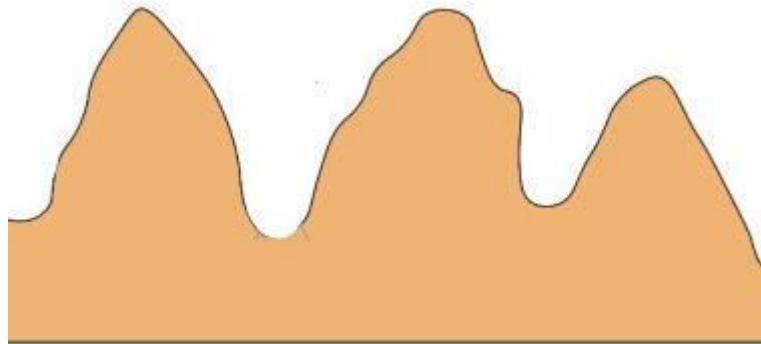
The D-layer has the lowest electron density and is only present in daytime. It is unable to refract HF signals. The E-layer is the lowest layer of an ionosphere that is actually capable of refracting HF signals. The F1 and F2 are the highest layers and have the most effective and are most useful in short to medium distant and long distant communications respectively.

### Incidence Angle

The incident angle is the angle at which the signal reaches the ionosphere and determines how far the signal can propagate. The angle at which a ray approaches the ionosphere is dependent on the location of the transmitting antenna and the type of antenna used. The higher an antenna is placed, the lower the incidence angle. This means that the signal will travel farther.

Due to lower incident angles, skip zones may be formed. Skip zones are regions where no HF signal can propagate either by skywave or groundwave.

The problem with HF lies that it can't be used in the skip zones. A point to note is that skip zones are most prevalent in mountainous terrains. This means that there is no Line of sight communication possible due to mountains obstructing HF signals. Groundwave communication too is not preferred in mountainous, rugged and dry terrains because of the poor ground conductivity. Regular skywave communication too would not work well because of the skip zones that are caused.

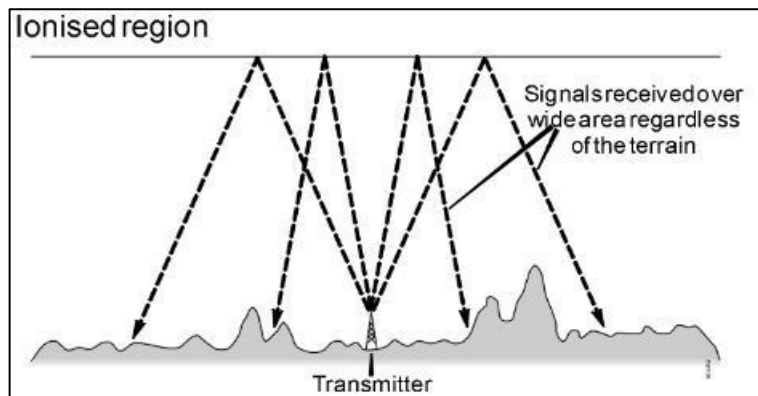


**Fig.4** Challenging terrain example

### Experimental

Increasing the use of NVIS in military communications is a key strategy. NVIS or Near Vertical Incidence Skywave propagation. NVIS is still skywave but as the name suggests, the incidence angle is near to being vertical. This allows for skip zones to be skipped and signals to reach receiver no matter the terrain. (See Fig.5).

**Fig.5** NVIS propagation



Due to the fact that the propagation method is still skywave we can still get all the advantages of skywave communication:

- They are ad hoc communications between a transmitter and receiver.
- Signals can propagate over thousands of kilometers rather efficiently.

This can increase efficiency in communications in terrains that are not suited for groundwave and LOS communication.

### RESULT

Recent research gives us a general idea about the rise of military use of NVIS proving the efficiency of the use of NVIS. Almost all the Tanks, ships and other military equipments use High frequency to function at their best.



### CONCLUSION

HF propagation has increased over years and can help empower defenses of a country when used for communication purposes. They may have some drawbacks but there are ways to cope with them, for example, using NVIS principles.

### Acknowledgements

This paper and the research behind it would not have been possible without the exceptional support of the staff of my school, Ram Ratna International School. Their enthusiasm, knowledge and exacting attention to detail have been an inspiration and kept my work on track without any distractions. The generosity and expertise of one and all have improved this study in innumerable ways and saved me from many errors; those that inevitably remain are entirely my own responsibility.

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### IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT

**Yatee Shirke**

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#### **Abstract**

Innovation, continuous improvement and growth are fundamental requisites for any business to achieve long term viability. An analysis of the responses collected indicates that leadership style impacts tremendously in organisational growth. Who are great leaders in business? The most significant business leaders in the world today, changed the face of business with their ability to lead and bring transformation in various segments. Apart from business strategy, strong leadership contributes towards organisational success. As a strategic thinker, leaders have analytical abilities to understand the context of business. Highly successful business leaders visualise growth, process, sustainability factors and risk management. Analyse everything deeply and prevent any disability.

#### **Introduction**

The role of leadership in an organisation is crucial in terms of creating a vision, mission, determination, and establishment of objectives, designing strategy, process, policies and methods to achieve the goals. Leadership style dimensions have a significant impact on organisational performance and growth. At present scenario changes occur in the external environment affecting productivity and efficiency of employees, many companies facing high labour turnover, unethical practices and financial losses. Hence, organisations need leaders to influence, motivate and enhance overall performance of the business and entire ecosystem.

#### **Hypothesis**

Based on a survey conducted recently defines six major leadership styles of leaders throughout the globe- autocratic leaders, democratic leaders, participative leaders, bureaucratic leaders, charismatic leaders and transformational leaders.

The leader's ability to make people work together for a common goal or objective leads to multidimensional growth of business. The business performance is driven by leaders of the organisation. The leaders inspire employees, meet the emotional needs of employees, improve skills, competency by providing various platforms. The leader develops an environment in which the employee feels connected, aligned with organisational goals where employees overall performance is improved.

A leader elevates the interest of employees, motivates, creates positive impact, encourages innovation, creativity and brings transformation in business. The primary responsibility of a leader is to solve problems. A leader is an excellent communicator, thinker,



decision maker, team making and image builder. Great leaders can maximise projects of any business.

The best example of today's business tycoons and great leaders of the modern business era, to name a few those have brought transformation in society and impacted tremendously are:

1. Sheryl Sandberg: Sheryl Sandberg has been Facebook's COO. She was an outspoken supporter of women in the workplace throughout her career. She has made an excellent adjustment since leaving the government and joining Google and Facebook.
2. Jeff Weiner, the founder but also the CEO of LinkedIn. Despite the fact that LinkedIn was created in 2002, it's under Weiner's supervision that the company completed its initial public offering and became one of the most widely utilised social networking sites in the world.
3. Reed Hastings: Founder and CEO of Netflix, Hastings, is a well-known figure. What began as a subscription model with no late penalties and no due dates rapidly evolved into streaming services, which rocked the basic foundations of online entertainment to their core.
4. Mary Barra Barra is the chief executive officer and chairman of General Motors. Before joining GM, she was the company's Executive Vice President of Worldwide Business Development, Procurement, and Supply Chain etc. She is now competing for a position in the electric vehicle industry.
5. Reshma Saujani: Saujani founded the non-profit Girls Who Code, which encourages young women to pursue technical education (particularly coding). The American lawyer and activist have a number of accomplishments to her credit. Over 10,000 girls have participated in camps organised by her firm, Girls Who Code, which has locations in 42 states.
6. Jack Ma. Ma was the first mainland Chinese entrepreneur to be featured on the front cover of Forbes magazine. Aside from that, he is the creator of the Alibaba Group, which is a collection of internet-related businesses. Ma was rejected from three different universities before being admitted to Hangzhou Teacher's Institute.
7. Elon Musk, The South African-born businessman and inventor Elon Musk is also an investor. Musk's most well-known accomplishments include the development of PayPal and SpaceX and his significant participation with Tesla Motors. His imagination and drive to expand the frontiers of technology and market integration have increased public awareness of solar energy, high-speed mobility, and artificial intelligence, among other technologies.
8. Bob Iger, serves as the Disney Corporation's Executive Chairman and is the company's former CEO. During his leadership, Pixar, Marvel, and most notably Lucas Films were all bought by Disney. The growth of Disney's attractions into Hong Kong and Shanghai has also been a result of his leadership.

And must not forget the leadership of Warren Buffett, famous as one of the world's greatest investors, Tim Cook. Cook is the CEO of Apple, the most valuable firm in the world, Bill Gates, established Microsoft, the world's biggest personal computer software firm



### Conclusion

The primary function is to identify the strength, weakness, opportunity and threat of the organisation. Effective decision making is crucial for the survival of any business. Hence, the impact of leadership is extremely high to manage and grow a business. Effective communication is the greatest strength for successful business leaders. The leaders impact the entire business ecosystem by implementing strategies for customer satisfaction service excellence, initiate projects for future growth, adopt technology changes and direct employees to achieve business goals.

## WIRELESS TECHNOLOGY: IT'S ROLE IN MILITARY COMMUNICATION TO EMPOWER DEFENSE OF A COUNTRY

Aaryan Dambe

Ram Ratna International School

### Abstract

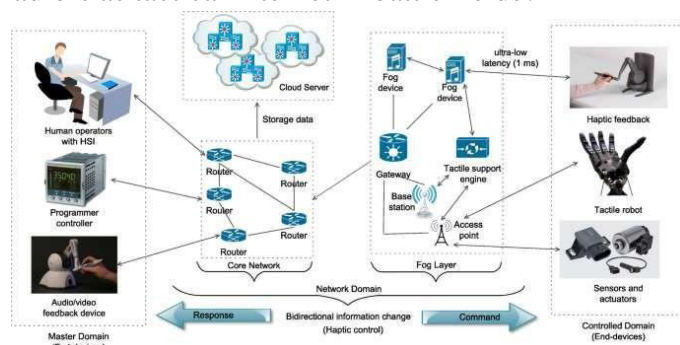
Ever since the birth of wireless technology by Guglielmo Marconi in 1896, it has been used for the military purposes, communication, and the safety of soldiers. The technology has been favoring humanity every time they needed it, but as time flies, the modernization around the world made the fast-paced growing wireless technology look lingering. Therefore, this paper focuses on how can wireless technology be used to improve military communication, and how it can be optimized for the soldiers survival and safety monitoring, making use of wireless technology for different compartments of military defenses of a country; for example in alarming system of intruders in the army bases.

**Keywords:** *Headquarters deployment augmentation, leap, cluster base, Joint Tactical Radio System (JTRS), Tactile internet.*

### INTRODUCTION

This paper is mainly intended to implement the role of wireless technology to empower the military communication and country's defense. Wireless technology, such as in cell phones, uses radio waves to transmit and receive data; It is used increasingly for data transmission. The military tried several ways to upgrade their wireless technologies, but listed below are some improved methods for it to be implemented for the country's defense like wireless sensor network, integrated sensors deployment in soldiers vest ,using joint tactical radio systems for better communication , usage of DoD's of country defense , etc. Communication plays a vital role in military defense system and there are still many ways to improvise upon it through different emerging technologies, but these have magnetized negative attention from the malignant enemies of country who are supposed to infiltrate the sensitive data of government servers and the transmitted signals from the wireless sensor system for their own gain, which can be referred as military cyber-attacks. Consequently, in this paper we are going to discuss:

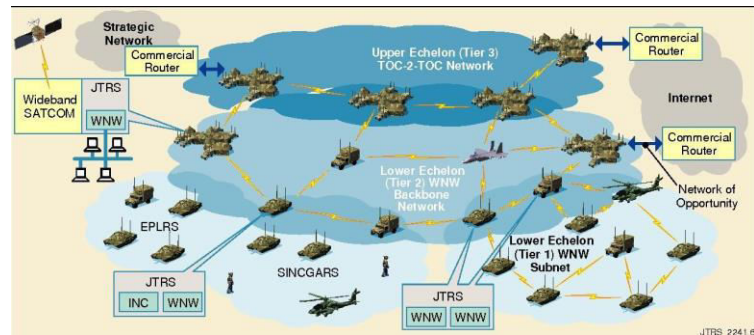
- 1) How can we make Usage of New/Old radio`s as tactical internet in battle fields?
- 2) Different ways for advancing the soldier communication and safety vest
- 3) How we can use the wireless sensor network as alarming system?
- 4) Wireless sensor system threats which occur
- 5) Valid solution as unmanned vehicle to reduce the threat faced by wireless sensor system.





## Theory

1) How can we make Usage of New/Old radio's as tactical internet in battle fields? When it comes to strengthening a country's defense, the first thing which comes to our minds is military security, thus becoming much more significant while war or combat training to rookie soldiers. About the usage of the radio, we can use the joint Tactical Radio System (JTRS). JTRS is a family of radios and a family of communications waveforms designed to be interoperable and provide military forces with next-generation systems for digital voice and data communications during military operations. It will let our soldiers focus on making commanding decisions, rather than giving voice transmission of their location. Now this technology will transmit radio text messages back and forth between individual combat elements in real-time, which are regularly translated on to a digital map background on to the user's compact computers. This type of communication will build a tactical internet; combining a different types of SINCGARS (Single Channel Ground and Airborne Radio System) and making usage of Joint Tactical Radio System which will create a better improvised army technical architecture, and the leading commanders having the 'troop codes' will make the software of JTRS easy to alarm the other troops of commanders.



Basically tactile internet is a sub-class of an IOT (internet of things) which helps an basic/advance technology to work by abnormal way for example through hand gestures, eye contact, through brain impulses, etc. So firstly, the plan could to control the

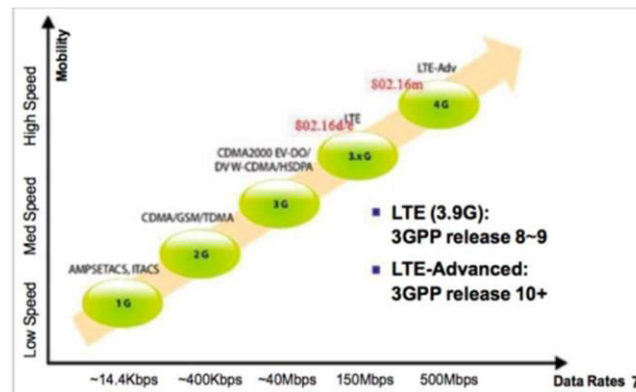
radio software through brain impulse, because if on the battlefield the commander is injured and is struggling to move his hand so he can easily alarm the army base/headquarters through brain with the help of tactile internet. These kind of technologies can be also be used like:-





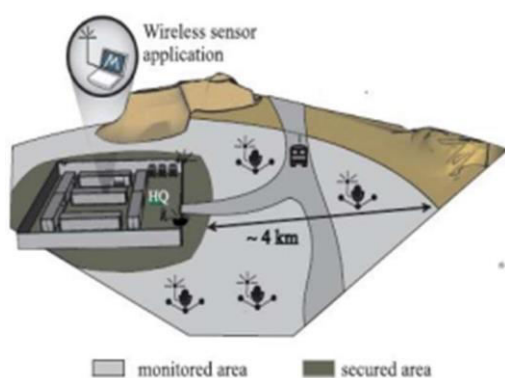
However, it can be also added that the Joint Radio System, can be used in Headquarters deployment augmentation with the signals from the compact device of soldiers; therefore, the headquarters can easily deploy their troops at the emergency point where the other commander needs help or backup.

Now, the main problem occurs after brainstorming on the solution, the accumulation of the higher frequencies, larger bandwidth and greater sensitivity to anchor the uninterrupted network. The answer for this question may be the LTE (Long Term Evolution) which is being used in our mobile phones and communication devices. The LTE can be combined with the military communication devices, which will end up being beneficial for the military as it makes the network much safer, and gives multiple deployment bandwidth of 1.4 MHz, 3 MHz , 5 MHz ,10 MHz, 15 MHz, and 20 MHz . The LTE has got several notable advantages that stats - The flexibility of LTE allows it to be used in both land and maritime defense applications. Video streaming for increased situational awareness is a crucial component of network-centric warfare. Defense users may be able to take use of advanced current hardware and software solutions that have demonstrated commercial performance in a variety of physical situations, ranging from broad open countryside to congested metropolitan areas.



2) Different ways for advancing the soldier communication and safety vest. Military utilization has an enormous numbers of data flow through sensors. They need a data median that can join the necessitates, of a single data stream that can integrate video feeds from drones targeting radars with intercepts from mobile phones. More sensors may now be integrated into soldiers' systems with less weight, size, and battery consumption. As the defense industry is turning up all the tables to a new generation of technology quicker, inexpensive, and more flexible communication. The communication is now adhered wirelessly directly to the war fighter for the country's defense. Therefore, the military needs a highly modernized vest which will give them all essential system in a easy access. A vest which has many technologies like the retractable night vision, blast detection monitor, navigation sensor, health monitor, GPS, JTRS radio, etc. The vest will give the soldiers local and remote spectrum monitoring and surveillance system, and Global Positioning System (GPS) protection against spoofing and jamming

threats. The vest will be consisting of a central compact computer which will be controlled by the soldier to access the system for information, for example:- if the soldier wants information about their location so the computer will execute its command to drag down the particular system to come under the soldiers control by displaying its location through GPS or the navigation sensor. This control over the central monitor on their arm/wrist would be made uncomplicated by the custom made military software being used by the computer; which will include the most user- friendly options of icon and buttons . The computer screen being touch screen will be making this application much easier to use and if the soldiers needed will be even trained for the usage of the software application. Computer may look some like this:-



Wireless Sensor network based military monitoring |

### Experimental

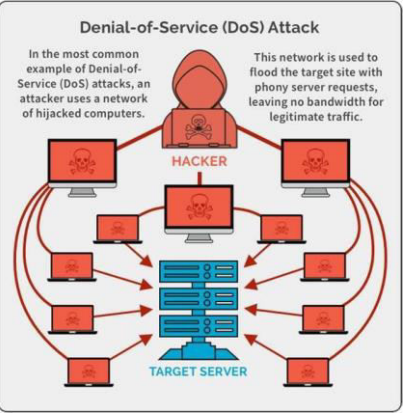
3) How we can use the wireless sensor network as alarming system?

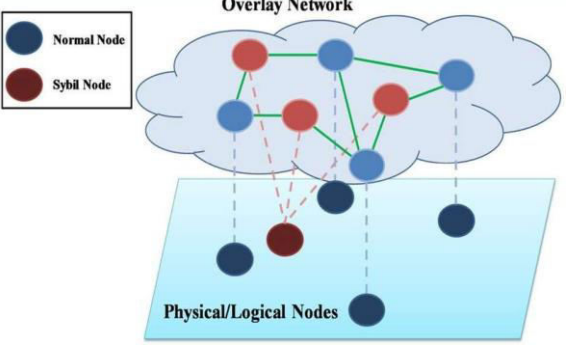
The main function of the wireless sensor network is to observe the enemy movement and synchronize the activities of the army .The nodes (it's a sensor node which is capable of performing some processing

, gathering sensory information, and communicate with other connected nodes in the wireless sensor nodes ) will be deployed at the place we want to monitor in the given range as the figure shows. There will be also an

base station in the headquarter(HQ) to control the nodes and collect, process, and analyze the information from the various nodes. The nodes are connected with various sensors to sense the environment for enemy movement and coordinate with the soldiers for the same. There are various kinds of sensors which are connected to the nodes, like camera sensors which detect the motion, face and scene of the enemy in the quickest and the clearest way possible for the nodes. It also uses MEMS (Micro-electro-mechanical systems) sensors for friend-or-foe identification for the enemy, who conquers and this information is passed to the soldier during the emergency by the base station .The nodes connected with the sensors will periodically send message to the base station in the case of any suspicious activity. Then the base station will receive the information from various nodes and will take the necessary actions like notifying the commando for that particular area or give messages to nodes surrounding that area .

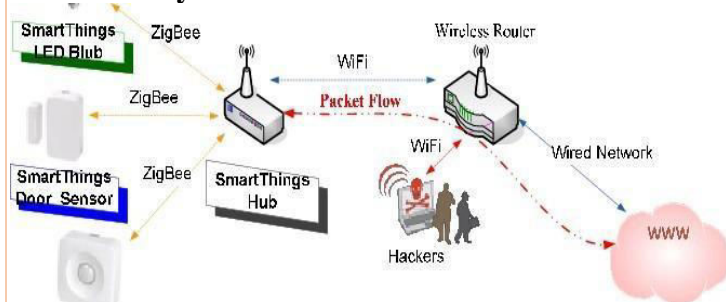
4) Wireless sensor system threats which occur due to its security issue?  
 There are several security issues found in the wireless sensor system; here are its few issues which can cause threat to the military :- (In the table below) |

Types of the security issue	Brief explanation about the threat
<p><b>Denial of Service Attacks</b></p>  <p><b>Denial-of-Service (DoS) Attack</b></p> <p>In the most common example of Denial-of-Service (DoS) attacks, an attacker uses a network of hijacked computers. This network is used to flood the target site with phony server requests, leaving no bandwidth for legitimate traffic.</p>	<p>In our case, it a malicious act where a malicious user who tries jamming our nodes.</p> <p>In easy terms it uses spamming to our nodes continuously to confuse them. Or in other case it can spam several inappropriate messages to the particular node to create collision with the radio signals which consist an appropriate messages.</p>
<p><b>Sybil Attack</b></p>	<p>In our instance, the malicious user create a small number of entities</p>

 <p><b>Overlay Network</b></p> <p>Normal Node          Sybil Node</p> <p>Physical/Logical Nodes</p>	<p>who are the clones of the multiple original nodes. This will consists of some share of the system, and this will let the hacker get many node Id's which gets produced to get closer to the network they want to overlay and intercept its message routing which creates a lot of traffic in the</p>
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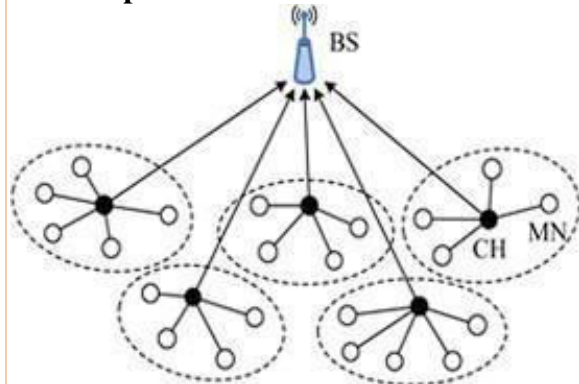
military network.

### Traffic Analysis Attacks



It is method of the enemy which follows the flow data packets from nodes to nodes to understand its pattern, and to know its main node which is nearest to the base station and sends all the information.

### Node Replication Attacks



It may feel the same way as the Sybil attack but in this instance the node is added the original wireless sensor system and clone the other nodes already existing and this can only change functionality of the network between the nodes and the base station.

<p><b>Attacks Against Privacy</b></p> <p>The diagram illustrates a network with several nodes. A yellow node on the left is connected to a white node, which is connected to a red node labeled 'Compromised Node'. From the red node, a dashed line labeled 'Routing Path' leads to a green node labeled 'Base'. A solid arrow labeled 'Traffic Analysis' points from the red node towards the base. Another solid arrow labeled 'Data Analysis' points from the red node towards the base. There are several other white nodes scattered in the network.</p>	<p>In our case, this attack can be taken place after the traffic analysis attack the malicious user may track the node and take out their needed information like the coordinates of the critical areas.</p>
<p><b>Physical Attacks</b></p>	<p>It is a method or act the enemy's use to physically enter the environment to alter the hardware of the</p>

<p>The diagram shows a central 'CYBER-PHYSICAL SYSTEM' with five components arranged in a circle: 'sensor' (orange), 'communication' (blue), 'actuator' (orange), 'storage' (blue), and 'computing' (blue). A legend indicates that blue represents 'cyber' and orange represents 'physical'. Security threats are listed around the components:</p> <ul style="list-style-type: none"> <li><b>sensor</b> (physical): sensor spoof, DoS</li> <li><b>communication</b> (cyber): eavesdropping, packet modification, man-in-the-middle attack, resource blocking</li> <li><b>actuator</b> (physical): authentication failure, deadline miss</li> <li><b>storage</b> (cyber): storage modification, data remanence</li> <li><b>computing</b> (cyber): information leakage, enforced computing error, timing error</li> </ul>	<p>device. In our case, it will be the enemy's coming to alter the sensors of the nodes by destroying it or by reprogramming it in their own way.</p>
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5) Valid solution as unmanned vehicle to reduce the threat faced by wireless sensor system.

A solution to all this security issues which can cause threat to the military will be the notion of the unmanned vehicle controlled by a wireless sensor network in the military. This vehicle can traverse through the network and observe the network security. The vehicle will be made compact so it doesn't get any attention of the enemy. It will be controlled by the mote inside itself, and with a movable characteristic it can check the reported specific area to know if it is an emergency or a security attack issue. The node has infinite power therefore it can be undertaken for maintenance. There can be several features added to it like a camera for letting the base station soldiers get a brief look at the situation occurred or the night vision to keep the security of the stable notes, different type of sensors. The importance of localization is to link the vehicle location to the base station location. We can use GPS, with the global positioning information we

can finalize our next movement. The driver mote will send the sensor information to the other motes and wait until they reply the position from the base station through the motes. Aside from the navigation, the driver mote has additional responsibility such as deploying motes and maintaining the wireless sensor network.

Let's take a case where the wireless sensor network is divided into clusters. Every cluster will contain a set of motes in the specific area. The set of motes in the cluster will decide it's leader who will be named as the cluster head. The head will entirely bundle up all the messages from the cluster member. To keep the security's issues in mind, we will be following the LEAP key management. The LEAP has four sets of keys from which two we have is from the individual key and the cluster key. The individual key will distributed to all the nodes before deploying it which will help them to encrypt messages they want to send to the base station or the unmanned vehicle mote. The base station and the unmanned vehicle has the other two keys to decrypt the encrypted message send by the stable nodes. The sensor reading of the environment made by the motes will be encrypted by the cluster key and send to the cluster head ; then the base station will decrypt the information with the help of cluster key and then it informs the further steps needed to be taken.

Consider the instance that infrared sensors are equipped by the all the motes to identify the movement of the intruders in our area. These nodes will send the message to the cluster head and then the cluster head will report this to the base station . Suppose the base station wants to cross check whether or not the event did really happen. It will move the unmanned vehicle mote to the region it is rumored to have emergency with the help of GPS or surrounding sensory location. The motes in that area will be equipped with the sensors, which will collect all the important data and sensory information from the encircling and pass it to the vehicle mote. After collecting all the data the vehicle will immediately send the same precise values to the base station. The base station will then compare the values and if it is made out to be different, they can take acceptable actions like informing the soldiers in charge of the nearest troops or activate the mines etcetera. Further the vehicle mote can be used to understand the situation better by using its advance tools like camera or alternative sensing device .the vehicle mote and the base station have direct communication with all proper encryption methods since they both are powerful and have infinite battery life. We charge the battery life of the vehicle with the use kinetic energy due to its movement of wheels.

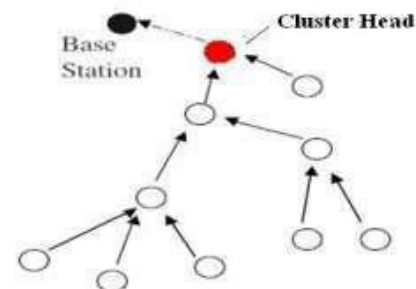
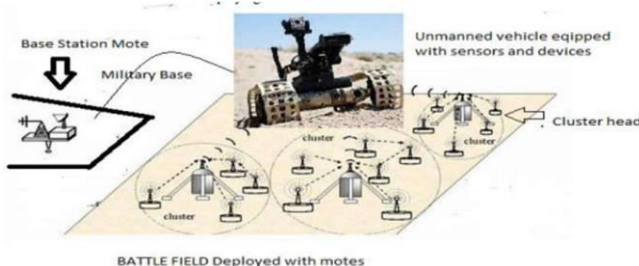
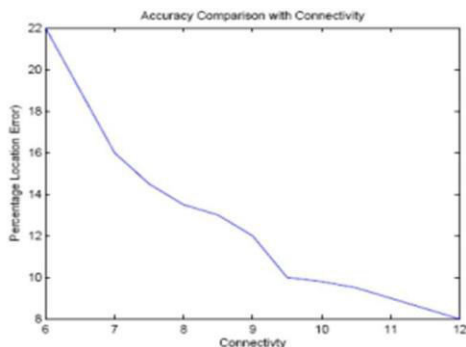
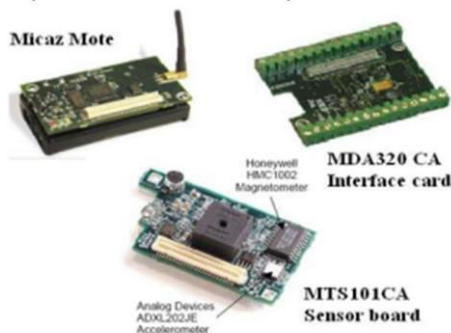


Figure 3. Data aggregation by Cluster head



6. Wireless Sensor network based military monitoring.



The Mote, Interface card and Sensorboard [User Manual].

Now coming to the implementation of this unorthodox unmanned vehicle mote, firstly listing up its hardware needed would be the mote, the interface card and sensor board. These components specifically can be used :- Speaking of software now, as the software used in the base station and on the wrist of soldiers' vest could be a custom made operating system with its IT sectors or TinyOS which is a real time operating system designed for these kinds of applications, which need many additional programming in it like to navigate the vehicle to a particular location, to program it to analyze the sensor data, etc. The result of wireless Sensor network usage in the military system was quite impressive, here is a line graph for the reference :- (on the right side).

### Conclusion

Communication is a key part of every country's military system and making this communication wireless makes the soldiers free of dangling wires and even increase their mobility while in emergency. Now the wireless technology has emerged so brightly that the military can now easily reply wireless sensor network for the analysis of a particular area or the border. But due to the greater usage of it, there are cyber-attacks done on the motes and the unmanned vehicle. This is done to gain sensitive information of a particular country or the government done by the enemies to go through it during the need of war time. It can be even done to distract the country from a bigger threat set up by the rival country. But as the time passed, we did create several solutions to improvise on the wireless sensor system and will continue doing the same until we find the world's most secure military system. At the end I would like to say that the military should optimize the wireless technology at its upmost but should always keep the physical backup of wired and human-based application for communication and analysis because the best prepares for the worst situation.

### Acknowledgement

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## An International Multidisciplinary Research e-Journal

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### EFFICACY OF FORENSIC ACCOUNTING IN CURBING CORRUPTION AND FINANCIAL FRAUD: A SCRUTINY OF CASE STUDIES FROM ASIA AND AFRICA

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#### Abstract

Corruption and Financial fraud collectively swindle economies of over \$ 8.3 trillion a year, the opportunity cost of which is paid financially and socially at the expense of people's incomes and quality of life. In light of this jarring statistic, measures to counteract this grave felony are being implemented, where leading at the front of the battle is Forensic Accounting.

This paper examines the efficacy of previous efforts exerted by forensic accounting against corruption and frauds in a more global context. It is a comparison and evaluation of successes across nations in Asia and Africa, carefully selected for their geographical location and poor transparency in corruption for a global comparison. Deeper examination and a thorough reading of past records proves with evidence the assumption that Forensic Accounting indeed aids to detect and reduce the incidence of Corruption and Financial Fraud.

**Keywords:** Forensic Accounting, Financial Fraud, Corruption.

#### INTRODUCTION

In most developing countries, fraud and corruption is socially considered a way of life, a menace which cannot be eradicated.

As per the World Bank, Corruption is the 'abuse of public power for private benefit'[1]; it involves a variety of unscrupulous practices including embezzlement, nepotism, cronyism, under the table donations, kickbacks and a wide variety of frauds.

Privilege	Preference	Payment	Power
Cheating	Procurement	Laundering	Fraud
Theft	Trading	Bribery	Embezzlement
Disruption	Cronyism	Graft	Malfeasance
Ineptitude	Nepotism	Swindling	Influence
Falsification	Discrimination	Extortion	Harassment
Immunity	Favoritism	Kickbacks	Suppression
Evasion	Exclusion	Skimming	Protection

Table 1 Types of corruption. No name. "Types of corruption." "Corruptioncontrol.com" [http://www.corruptioncontrol.com/Types\\_of\\_Corruption.html](http://www.corruptioncontrol.com/Types_of_Corruption.html) (accessed Jun. 5, 2022)



Fraud, proclaimed as the twin brother of corruption is deceptive and cunning in its nature. As per Albrecht; “Fraud is a deception that includes the following elements: a representation about a material point which is false, and intentionally or recklessly so; which is believed and acted upon by the victim, to the victim's damage.”[2]

These notorious activities are cause for much concern, on a personal level they exploit the money earned by a hard working individual, on a larger scale they cost nations billions upon billions in a year; not only are losses paid for monetarily but also in the reputation and administrative performance of an organization.

Consequently, these have severely stunted the growth of economies, even causing the collapse of world renowned and massive companies, such as WorldCom and Enron.

Given the dire implications of such malversation, it is imperative for measures to be taken to find a means to an end.

Forensic accounting offers such an opportunity. Forensic Accounting is a specialisation of accounting investigating whether firms partake in financial reporting misconduct. This is best summarised by Crumbley, Heitger, and Stevenson Smith as: “...the action of identifying, recording, settling, extracting, sorting, reporting, and verifying past financial data or other accounting activities for settling current or prospective legal disputes or using such past financial data for projecting future financial data to settle legal disputes.”[3]

The high scrutiny of forensic accounting makes it one of the best, if not the most effective countermeasure to corruption and fraud. Having realised the vast potential it holds, the field has gained momentum and continues to grow exponentially, additionally numerous past publications have investigated the viability and potency of forensic accounting (and its investigative techniques) as a tool to detect and curb corruption and fraud in individual countries or national contexts.

In this paper, the data used to determine the extent of corruption in a particular nation is sourced from the Corruption Perception Index, which collects data from corruption surveys and assessments obtained by reputable institutions. Every country is given a score which illustrates its perceived level of public sector corruption on a scale of 0- 100, where 0 denotes very clean and 100 represents highly corrupted; the rank assigned to a country shows its position/ condition relative to other countries in the index. All values quoted are from 2021.[4]

The assessment of nations with higher scores depicting relatively severe degrees of malversation are more relevant to the aim of this study. Consequently the countries chosen for probing concentrate themselves in the continents of Asia and Africa.

The four countries inspected are listed as follows: Sudan, Iraq, Kenya, India.

Country	Continent	CPI score/ out of 100	CPI rank/ out of 180
Sudan	Africa	20	154
Iraq	Asia	23	157
Kenya	Africa	30	128
India	Asia	40	85



### Theory

In addition to the context given pertaining to how Forensic accounting, Corruption and Fraud is distinguished, an understanding of various statistical tests and measures is necessary to fully comprehend the depth of the results procured.

They are listed as follows:

$\alpha$  Alpha Cronbach constant: A measure to assess the internal consistency or reliability of a given measurement. This coefficient of reliability  $\alpha$  ranges from 0 to 1; completely independent items which are not correlated show  $\alpha = 0$ , items with high covariances show values closer to  $\alpha = 1$ . Cronbach alpha values of 0.7 or higher usually deem acceptable internal consistency.

$\tau$  Kendall correlation: A measure of the rank correlation of two measured quantities. The coefficient  $\tau$  when high attests that observations are of a similar rank, and low values of  $\tau$  depict dissimilarity in the rank of the variables.

Analysis of Variance (ANOVA): a collection of statistical measures used to analyse the differences in the mean.

Regression equation: A technique to determine whether a relationship exists between one or more variables or dependency. Further analysis can obtain an estimate of the impact of a change in one variable on another.

$R^2$  Coefficient of determination: A measure to assess the ability of a model to explain or predict an outcome in a linear regression setting.

Adjusted  $R^2$  is a modified version of  $R^2$  which accounts for the predictors not significant in a regression model.

T test/ Student's t test: An inferential statistic used to determine or compare the difference in the means of two groups.

Student's t distribution: a probability distribution alike the normal distribution distinguished by a bell shape having heavier tails. It is used for small samples sizes with extreme values, or when the standard deviation for the population is unknown or both.

p value: the probability that the result obtained from sample data occurred by chance.

One sample t test: a technique to determine and measure the extent to which the hypothesised/ expected mean value of the variable is different from the observed/ obtained mean value of a continuous variable.

A t value here is the ratio of the difference between the variation within the sample sets and the mean of the two sample sets.

A p value here lesser than 0.05 suggests the observed mean is significantly different than the values hypothesised by researches. A value greater than 0.05 showcases that the observed mean is not substantially different from the value expected by the researchers.

### DISCUSSION

As mentioned previously, this paper will assess existing records on the competency of forensic accounting in combatting and curbing corruption and financial fraud. This segment is a literature review of existing investigations of the contribution of forensic accounting to achieve the aim as mentioned previously.

*SUDAN, SUB-SAHARAN AFRICA[5]*



SayedAhmed and Elseed (2019) conducted a field study comprising of 50 individuals of varying ages, educational qualifications, scientific backgrounds, professional positions and experience. The hypothesis read as: 'Forensic accounting methods provide information that helps in reducing the phenomena of financial corruption.'

One of the questions asked was-'Forensic Accountant's investigation of illegal activities helps in reducing the phenomena of financial corruption. To this 26% (13) 'Agreed' and 50% (25) 'Strongly agreed'. 12% (6) said they 'Disagree', while 6% (3) said they 'Strongly disagree'. The rest 6% (3) were neutral.

It had an Alpha Cronbach coefficient of 0.865, a high value such as this affirms the credibility of the data.

### IRAQ, MIDDLE EAST AND NORTH AFRICA [6]

Alabdullah, Alfadhl, Yahya, and Rabi (2014) investigated the circumstances in Iraq. A group of 29 specialist lecturers from auditing, accounting, and public administration were surveyed with the Efieng(2012) study with the addition of certain variables which enhanced the nature of the study.

### **The hypotheses being investigated were as follows:**

H1: There is a significant correlation between the forensic accounting education and the effectiveness of detecting the financial corruption activities.

H2: There is a significant effect relationship between the forensic accounting education and the effectiveness of detecting the financial corruption activities.

Kendall's correlation coefficient between the variables 'forensic accounting methods' and 'detecting corruption effectiveness' was  $\tau = 0.41$ , a seemingly low score which was justified to being acceptable for one variables keeping in consideration the novelty of the approach.

In order to verify the significant correlation between the two variables,  $\tau$  was passed through the student's (t) distribution, whereafter the calculated T value,  $T = 2,350$  was found to be greater than the theoretical T,  $T = 1,701$  value, which confirmed the first hypothesis, leading to its acceptance.

A regression equation was used to determine whether an effect relationship existed. The equation used was:

$$Y = a + \beta_1 X_1$$

Where it indicates that forensic accounting education (x) affects the detection of financial corruption cases (y).

The Analysis of Variance (ANOVA) results were analysed to understand the relationship between the variables.

The calculated regression equation coefficients were then observed to see a definitive trend.

As seen in the results, the 'Non standard Beta coefficient' for 'Fixed' which is 3.127 indicates the discovery of corruption cases which forensic accounting mechanisms are 0, while the 'Standard Beta coefficient' for 'Forensic accounting' measured as 0.382 suggests that a change of 1 in forensic accounting methods will advance a change by 0.382 in the effectiveness of exposing financial corruption cases.

$R^2$  was measured to be 16.8% which signified that the shift towards the development and use of forensic accounting tools and software can support 16.8% of variation related to the detection of financial corruption, which the other 83.2% unexplained variance is caused by uncontrollable



factors irrelevant to the regression model. Since the results are acceptable since founded in the case of one variable, the second hypothesis can be accepted as well.

### KENYA, SUB-SAHARAN AFRICA[7]

Ng'ang'a (2015) explored the role of forensic accounting combating frauds in the insurance industry in Kenya. The study collected information from 42 companies by using a questionnaire. The mean to measure the effectiveness of investigative techniques used in forensic accounting ranged from 3.2143 to 4.8810.

The calculated adjusted  $R^2$  of 12.2% demonstrates that fraud will decrease by 12.2% with the application of forensic accounting. All quoted p values were lesser than 0.05 which attests that forensic accounting services substantially aid in fraud prevention in insurance companies. Analysis showed that Fraud prevention services has the strongest negative correlation coefficient, -0.31, the p value 0.04 influences fraud reduction in insurance companies.

When a regression analysis was conducted, the 'Unstandardised B Coefficient' for 'Constant' where the dependent variable was 'Fraud Prevention' was 13.250. Similar values for 'Investigation Services' read as -0.872 and -1.472 for 'Litigation support'. This goes to show that fraud prevention and forensic accounting are inversely related, a change of 1 in forensic accounting investigation reduced fraud by 0.872, and an increase in litigation services by one reduces fraud by 1.472.

### INDIA, ASIA PACIFIC[8]

Gupta and Vij (2021) investigated forensic accounting in the context of financial frauds in the Indian corporate sector. 100 accounting professions with qualifications ranging from graduate, post graduate, Chartered Accountant, Company Secretary and the Institute of Cost and Works Accountants of India were asked for their opinion following judgmental and snowball sampling.

The hypotheses being tested were as follows:

H0-There is no significant effect of forensic accounting in the detection and prevention of financial frauds.

H1-There is significant positive effect of forensic accounting in the detection and prevention of financial frauds.

A perusal of the descriptive statistics of the study results in the understanding that the collective sentiments of the respondents towards whether forensic accounting can be used effectively in the detection and prevention of financial records is positive. The opinion however is unconvinced pertaining to if forensic accounting is sufficient all on its own to detect fraudulent or suspicious transactions.

The one sample T test was then used to investigate the hypothesis.

For the statement: 'Forensic accounting is affective as a fraud detection and prevention tool'

T value:  $t(99) = 30.390$  and p value = 0.000.

For the statement: 'Forensic accounting as a tool is solely enough to detect suspicious or fraudulent transactions.'

T value:  $t(99) = 24.863$  and p value = 0.000.

Seeing as all the other values of p for the statements had a value lesser than  $p = 0.05$ , the null hypothesis is rejected and the alternative hypothesis is accepted.



The accepted hypothesis reads as: There is a significant positive effect of forensic accounting in the detection and prevention of financial frauds.

### CONCLUSION

The conclusion arrived from all the previous studies, inspite of differences in the manner of investigation, scope of the study, and individuals assessed; in both Asian and African nations is that Forensic Accounting aids to detect and reduce corruption and financial frauds. It is considered by most as an appropriate countermeasure to malfeasance, but cannot be relied upon as the sole remedy.

The case studies listed in this paper are some of the very few documented records or inspections carried out in nations suffering from corruption. In places where the incidence of corruption is particularly rampant, financial hardships are accompanied by a piteous state of the economy, as hyperinflation and soaring crime rates, worsened by a state of social unrest throw the country into chaos. Keeping account of the massive criminalities is out of hand and much of it goes undocumented, as in the case of Venezuela. A lack of records makes it more difficult to understand the state of affairs and how to counteract it, which serves to prolong the vicious cycle of deceit and misery.

Corruption and Financial fraud is a plague that countries all over the world suffer from, it is ingrained in society, affecting the smallest of businesses and even large scale multinational corporations, it is hence in the best interests for us, and the generations yet to come to rid ourselves of this menace which threatens the prosperity of the human race.

### Acknowledgements

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### THE EVOLUTION OF MODERN MARKETING AND ITS EFFECT ON COMPETITIVENESS

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#### Abstract

This paper attempts to analyze the effect that modern marketing has had on competitiveness in both small- and large-scale industries. The major conclusions were that marketing is in a phase where consumers lean towards the hyper presentative nature of new-age advertisement, and largely show subsequent commercial interest in such products. Participants across different age groups were surveyed on their response to novel methods of marketing and the results were quantified as such. This paper specifically aims to compare varying styles of mass communication aired recently, unlike other contemporary works.

**Keywords:** *Mass media-* Established forms of media such as television, the radio and newspapers. *Ad-* Advertisements *Traditional advertisements/marketing-* Advertisements that only include key features such as utility, price and the novelty feature (e.g., the unique scent of a brand of soap) *Modern advertisements-* Advertisements that push an 'X-factor' to the consumer (ads with a funny joke/reference, a play on current events, a storyline within the advertisement itself.)

#### INTRODUCTION

The subject is to compare the real effectiveness of varied styles in recent mass media ads. No fundamentals are required to understand the paper, besides the memory of aforementioned keywords, and statistical interpretation. Current works on the topic explain the impact and public reaction to ads, and broadly categorize them under labels of 'good' and 'bad' (see references.)

#### Theory

The theory- prior to conducting the actual research- is that consumers now look for added effort when being pitched to. The logical line of thought is that market saturation, and generalization of Unique Selling Points (USPs), makes the typical consumer seek something of face value that stands out (i.e., innovative marketing.)

#### Experimental

All users were briefed on important terms and the aim of the survey.

Firstly, I sampled responses from a set of participants, and converted their response into statistics. The three primary questions were: 1) What forms of mass media do you consume? 2) Out of these media, some must include forms of advertisement. From a non-commercial standpoint, do you prefer 'modern' or 'traditional' styles of advertisement (which would you rather consume?) 3) Which style is more likely to lead to your genuine interest in purchasing the product?



Secondly, I then logged onto two social media sites (Twitter and Instagram) and searched generic terms such as ‘marketing’ and ‘ads’ to assess what style of ads and which brands have been spoken about lately.

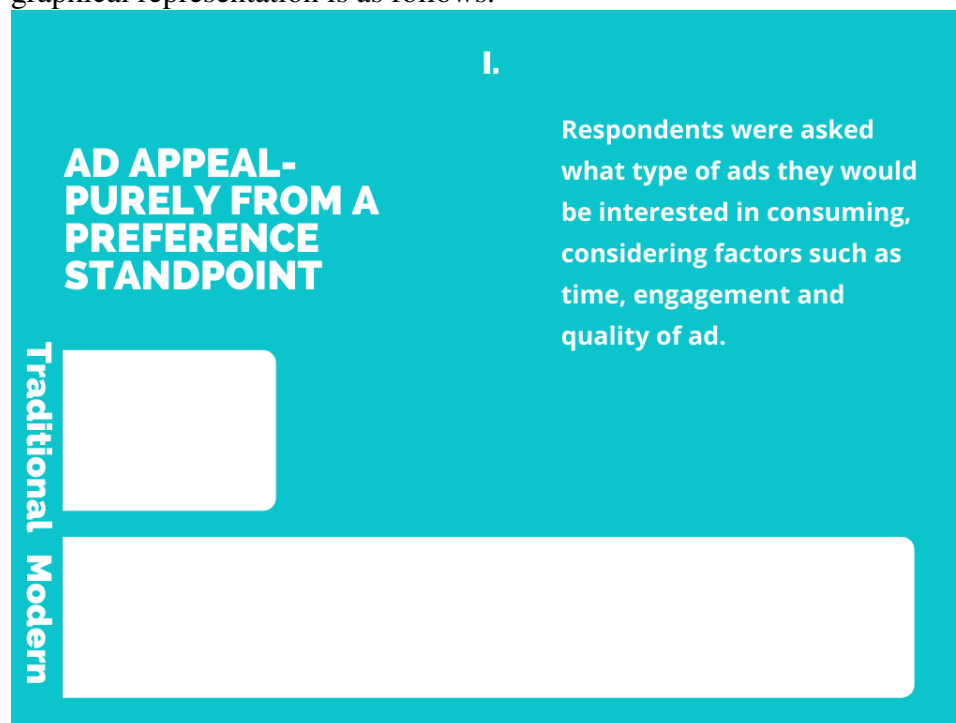
### RESULT

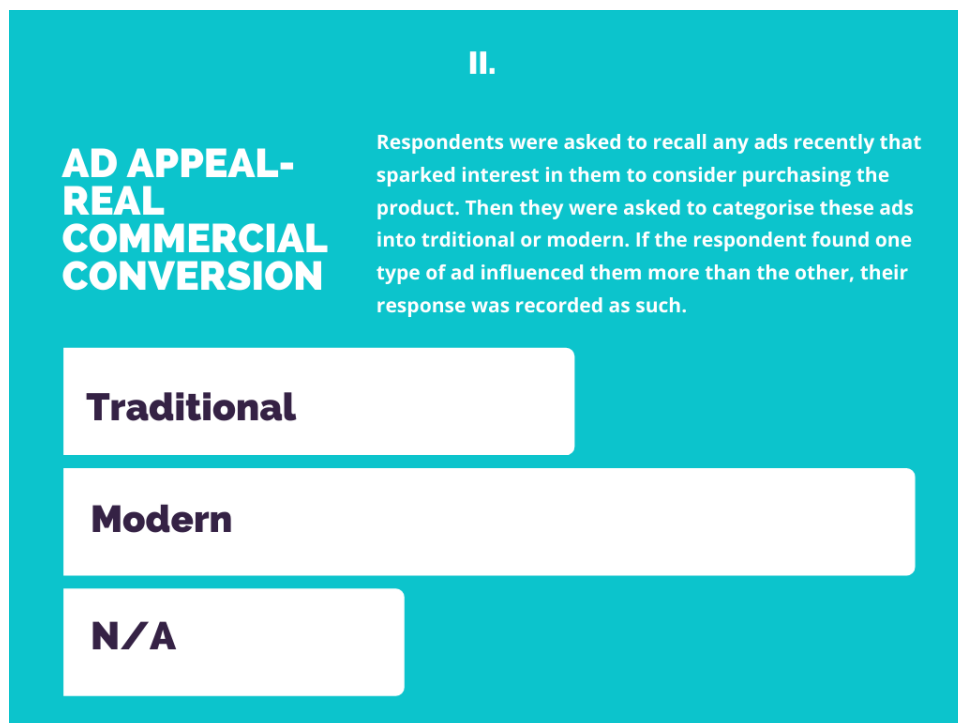
A total of 10 participants were surveyed. The groups included two broad categories- individuals above the age of 18 and those below. 5 participants were included from both demographics. The results were that while 80% individuals **preferred** to consume modern forms of advertisement, that number reduced to 50% when it came to them expressing subsequent **interest** in buying that product. Two of the ten surveyed suggested that marketing had no real effect on whether or not they buy a product. They entirely preferred to do their own research instead.

The social media observations reported similar results. Although they cannot be quantified, due to the sheer number of posts online, it was noted that modern advertisements were drastically more talked about publicly than traditional ads (examples mentioned in references in the form of articles).

### DISCUSSION

The results obtained were somewhat surprising. I expected more people, especially in the older category, to say they prefer shorter, traditional ads that stuck to the point (mostly with respect to the shorter span of time they’d spend to consume such an ad.) I also didn’t expect that participants who preferred modern ads would say traditional ones catch their interest better. The graphical representation is as follows.





### CONCLUSION

The results of this research impacts competitiveness- as smaller, newer brands now have the pulling power to sway consumers, with creative marketing. Established companies may not see the value in doing the same on that front, due to their existing prominence. However, they would potentially lose customers by doing so. The key statistics mentioned above reflect as such. However, the limitations of this study are that more work has to be carried out in a number of associated areas, in order to comprehensively compare evolving styles of marketing and how they affect competitiveness. Comparing effectiveness specifically within the target audience, type of product/industry advertised, and such, being a few examples.

### Acknowledgements

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## IMPROVISATION IN UNDERWATER COMMUNICATION FOR DISASTER MANAGEMENT

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### Abstract

The planet is composed majorly of water which covers almost 70% of its surface. This being established humans have still paid relatively less attention to the development of underwater communications and underwater networks. This difference in exploration and speed in development arises due to the toils that obstruct the replication of wireless sensor networks (WSNs) to their underwater equivalents. Maximum underwater deployments depend on acoustics for facilitating communication along with special sensors which can withstand the extreme conditions of the ocean. This paper mainly focuses on the development of underwater sensor networks (UWSNs) and their applications in the field of disaster management and their recent deployments.

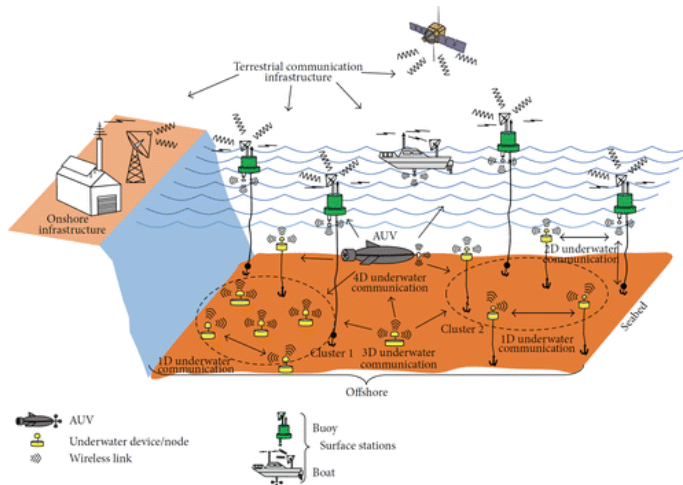
**Keywords:** Directed diffusion routing protocol, Remote station, Network topology, Remotely operative underwater vehicles, Optical communication, Deployment Salinity level

### 1. Introduction

Recent developments in technologies have led to the opportunity to do underwater explorations using sensors. An underwater sensor network (UWSN) is coming up as a technology which can break new grounds in underwater exploration. UWSN is a blend of wireless technology with micromechanical sensor technology having smart sensing, intelligent computing, and communication capabilities. UWSN is a network of autonomous sensor nodes that are spatially distributed underwater to sense the water-related properties such as quality, temperature, and pressure. The sensor nodes are connected wirelessly through communication modules to transfer information [10]. Underwater communication is mainly done with a set of nodes transmitting their data to buoyant gateway nodes that dispatch the data to the nearest remote station. The paper focuses on the applications of UWSNs to help detect, predict and manage disasters.

### 2. Underwater Sensor Networks Architecture

Underwater Sensor Network Architecture shown in Figure (1)



**Fig.2** Underwater Sensor Network Architecture

### 2.1. 1D-UWSN Architecture

One dimensional UWSN (1D-UWSN) architecture is a network of sensor nodes deployed autonomously. Every node is an individual network, it can sense, process and transmit data to the remote station. In 1D-UWSN the nodes communicate using radio frequency, acoustics or optical communication and it makes use of star topology.

### 2.2. 2D-UWSN Architecture

Two dimensional UWSN (2D-UWSN) architecture is a network where an assembly or cluster of sensor nodes are deployed underwater. Each cluster has an anchor node. The clusters are anchored at the underwater surface. Every node in a cluster collects data and sends it to the anchor node. The anchor node further relays this information to the surface (buoyant) nodes. In 2D-UWSN the clusters communicate using radio frequency (RF), acoustics or optical communication and it makes use of star, mesh or ring topology.

### 2.3. 3D-UWSN Architecture

Three dimensional UWSN (3D-UWSN) architecture, the sensors are deployed underwater in the form of clusters and are anchored at variable depths. The different positioning of the nodes at dissimilar heights, the communication between the sensors goes beyond the two dimensions. This architecture uses three types of communication: 1. Intercluster communication, 2. intracluster communication, 3. anchor-surface (buoyant) node communication. All the three communication types in 3D-UWSN can communicate using acoustic, RF, or optical communication.

### 2.4. 4D-UWSN Architecture

Four dimensional UWSN (4D-UWSN) architecture is designed by the amalgamation of 3D-UWSN and mobile UWSNs. The mobile UWSN is made up of remotely operative underwater vehicles (ROVs) to gather information from the anchor nodes and transmit the information to the remote station. As data is to be transmitted to ROV, the sensors containing bulky data and are in close proximity to ROVs use radio links whereas the sensors containing lesser data or/and are far away from the ROV make use of acoustic links [7,8].



### 3. Disasters and UWSN applications to manage them

Natural disasters are inevitable and therefore they can't be overlooked. UWSN offers a large variety of applications for the management of such disasters; it relates to the observation of events that worsen a disaster's after effect. Therefore, UWSN monitoring methods for disaster management are developed into a large range of applications like floods, underwater volcanic eruptions, underwater earthquakes and their ensuing tsunamis, and oil spills that cause above-the-water and underwater ecological fluctuations.

#### 3.1 Floods

The consequences of floods have resulted in the development of a timely flood alert system. The alerts needn't solely be placed on urban shores and thus need remote preparation. UWSN helps develop solutions for underwater device deployments with over-the-water relay agents.

**3.1.1.** A flood monitoring and alarming system developed with the assistance of UWSNs consists of a sensory module, observatory module, and transponder module. The sensory module is answerable for observing water and gathering water conditions like level, thrust, and intensity of water as flood indicators. The data is transmitted to the remote station for additional observations. The aim of the observatory module is to look at the data and predict the flood. The transponder module is employed for relaying the data just in case of a flood. The designed system is simulated and tested in perspective of its potency by varying the number of nodes deployed versus the time delay. The system is additionally tested for its localization error and also the space of coverage [1].

**3.1.2.** Another monitoring system like an acoustic UWSN system can be used for flood observation in rivers can be used. This system is based on a 4D-UWSN design that consists of underwater deployed sensors, AUV (Autonomous underwater vehicle), and a remote station. The device relays the data acoustically to the AUV that collects the data and transmits the data to the remote station. The designed system is tested on a 5000 m by 200 m wide river bed [2].

#### 3.2 Seismic Activities

Calamities like earthquakes and volcanic eruptions will occur anytime and anyplace over the surface of Earth and are even a lot more devastating if they occur underwater. Thus, it's vital to supervise such conditions.

**3.2.1.** With the help of 4D-UWSN system we can generate early warnings just in case of any risky event. It includes multicarrier communication and OFDM (orthogonal frequency-division multiplexing) for underwater communication in such situations. An efficient architecture for detecting tsunamis could be a sensor-based architecture that utilizes seismic pressure sensors to indicate the tsunami underwater and send the data through the directed diffusion routing protocol. The system works on the sense and response mechanism. As of now, only a few real deployed systems are present for tsunami and earthquake detection [3].

**3.2.2.** Another very efficient architecture for detecting tsunamis can be used, a sensor-based architecture that utilizes seismic pressure sensors to foresee the tsunami and transmit data by



directed diffusion routing protocol. The architecture functions over the sense and response mechanism. This system has a number of applications and they have been tested in a testbed environment [4].

A survey by Lloret, J. brings up that underwater natural disaster monitoring applications are abundant in number but only few have a complete design which can be deployed; hence a lot of work is still needed to achieve and improve underwater communication systems.

### 3.3 Oil Spill

Manmade pollution is an essential aspect to consider when talking about the deteriorating situation of aquatic life. Aquatic life is vastly affected by oil spills and this is why UWSNs have made it possible to find out the area affected the oil spills and their viscosity which can speed up the cleaning procedure.

**3.3.1.** An ad hoc UWSN that senses ocean contamination is developed, this system is built using vivid sensors, it has asynchronization algorithm, routing protocols, and a complete protocol stack. This improves the QoS (quality of service) [5].

**3.3.2.** Another system which focuses on designing a sensor that is able to sense, course, and relay data relating to the viscosity and site of the oil spill. This application proposes two algorithms Light Sensor Array and Conductivity Array in order to find out the viscosity of the spill this can further be linked to a simulator that plots real-time data on a map, revealing the location of the spill [6].

Flood applications tend to use RF in combination with 2D architectures this is done to maximize the area of coverage by deploying systems in clusters. This leads to low coverage UWSNs using RF communication patterns. Applications associated with volcanoes, simulation and analytical models are a more practical way to approach these problems. For oil spills applications and, analytical, simulation, and testbed models with the use of RFs and acoustics can be thought of with 2D, 3D, and 4D architectures.

**Table 1.** Comparison of UWSN disaster applications

Application	Architecture	DSL	Operable depth	Sensor type	Number	Communication Type	Implementation
3.1.1	2D	Canals	Few meters	Water level, thrust, intensity	Many	RF	Simulation, test bed
3.1.2	4D	River	Kilometers	Depth	Few	Acoustic	Test bed
3.2.1	4D	Sea	Kilometers	Pressure	Many	Acoustic	Analytical
3.2.2	3D	n/a	n/a	Pressure	Many	n/a	Simulation
3.3.1	3D	Sea	50-500 meters	n/a	n/a	n/a	Simulation

### 4. Conclusion

This paper uses literature review of UWSN applications and their classification. Along with their application in managing disasters. If these applications are correctly used and catered to, a lot of lives, money and time will be saved. Although UWSNs has seen an amazing quantity of growth within the past few years, there's still space for plentiful contributions, notably within the physical deployments of the systems on a giant scale.

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Ad Hoc Networks



### IMPACTFUL BUSINESS LEADERSHIP: PERSEVERANT HUMILITY OF AN ACROBATIC MIND

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#### Abstract

Business leaders influence the success and failure of the business. Their strategies and acumen are extremely vital to business values, and the way they tackle their workforce holds a credible effect on their financial fate. This research paper zooms into three major qualities of effective and impactful business leaders - *perseverance, humility* and a bold ability for taking *critically-thought decisions*. There is an attempt to prove that leaders possessing these qualities are able to adapt better to keep pace with the dynamic world, using various case study insights of yesteryears evidencing how these leaders influence the growth of their businesses.

**Keywords:** *Perseverance, humility, critical thinking, risk taking, leadership,*

#### Introduction

Advent of technology, birth of AI and robots are gaining the distinction of performing mundane tasks and replacing human brains. The conventional 9-to-5 jobs are fading. The race to acquire stacks of money has been a crazier bustle than ever. But not all ventures are successes! There could be multidimensional reasons leading a start-up's journey to a multi-bagger. But one person (or group) at the helm of the firm is completely responsible in the returns the firm fetches. Over the years the meaning, style and expectations from a business leader have changed depending upon changing business environment. Leaders have transformed from being the owners, to the visionaries, to mentors, to inspirations and a worker together. Today's leaders lead by example and help create a workforce, to achieve personal and professional success. Good entrepreneurial leadership is significantly influential to a successful firm, for extraordinary people make extraordinary decisions to create an extraordinary brand. John Maxwell rightly quoted, "Good leaders are one who knows the way, goes the way and shows the way." This really infers that good leader perseveres, is humble and has good presence of mind to take right decisions.

#### Hypothesis

The modern age entrepreneur needs to be vigilant, agile and proactive towards maintaining relationship with the stakeholders and leading from the front. The formula to a successful enterprise lies in the risk-taking ability of its entrepreneurs to evolve with innovation, the forming of a trustworthy dedicated team with concern and humility, the effective gathering of market insights, deploying successfully a rationalised efficient business model and using correct media platforms to advertise the products in order to establish brand value. The most important

of the qualities of a good leader are – perseverance, humility and critical thinking (acrobatic minds).

### Theory

There are various established theories of entrepreneurship which lay the fundamentals as to why and how an entrepreneur would do business. Some of the established theories also talk about the traits of an entrepreneur. For example, the opportunity-based theory of entrepreneurship by Peter Drucker states that “the entrepreneur always searches for change, responds to it and exploits it as an opportunity” [2]. To be able to exploit the opportunity, good business leaders have to be focused, strategic thinkers, innovators, action oriented, motivators. They should be open minded and creative. They must have a flexible approach. They should be responsible and dependable. To be a leader always, one has to change with the environment and adapt quickly while seeing from the lens of all stakeholders involved.

Business leaders must possess the following qualities to be the most impactful leaders:

1. Perseverance: determination and resilience
2. Humility: open-mindedness and compassion
3. Critical Thinking: Analysis and Risk-taking

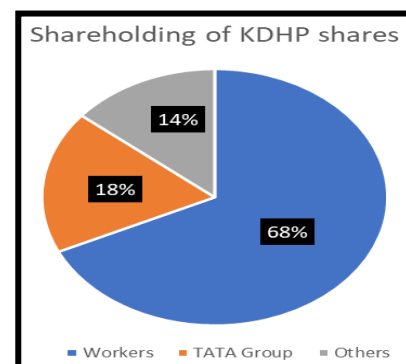
### Insights

#### 1. The downfall of Nokia

Nokia was a market dominant force in the 1990s, having gained the first-mover advantage in the cellular phone industry. They had gone from pre-revenue firm to a billion-dollar profit firm in the space of just 4 years between 1991 and 1995. The profit surged from \$1.745 billion in 1995 [3] to \$3.988 billion in 1999 [4] – the year where they reported 48% increase in revenue compared to 1998 and captured a formidable market share. Come the introduction of internet and software; Nokia was not ready to experiment into software-based phones, and their immense focus on hardware than on software costed them their market leader spot. Apple took the first step with OS-based iPhones, and in a haste to copy them, Nokia made a mess of its user interface before eventually crashing out [5]. A leader must back his products, but not inhibit them from evolving, because change is inevitable as technology evolves rapidly in today’s world. The business leader then failed to recognise the changing business environment and hence lack of critical thinking led to the downfall of the business. Taking calculated risks is crucial, experimentation is vital and methods such as design thinking help translate ideation into successful deployment to change as reaction to change in market, technology and consumer tastes. Most important leadership quality demonstrated here is critical thinking.

#### 2. TATA’s genius gesture for its labour at KDHP

Workers are backbone of any industry, especially the labour-intensive plantation industry. Tatas introduced participatory management system – the first in plantation industry, making Kannan Devan Hills Plantation (KDHP) the biggest employee-owned company in the world. This feeling of inculcation of belongingness was a direct incentive to boost labour productivity, which rose by 58% from 2005 to 2010 to turn a ₹8 crore loss into a





₹41 crore profit. **Fig. 1** shows shareholding of KDHP as on date. In January 2022, I visited the tea factory and personally spoke to the employees; they elatedly shared this rewarding master idea. The workers are a more prosperous lot, enriched by fatter bonuses and dividends, and capital appreciation of their shares that have shot up by 5 times [6]. The entire area around the plantation has developed as per the needs of the people. One could see happiness (greenery) on the hills and contentment within the workers and their families. A true example of development *of the people, by the people, for the people* shows an apt description of leadership qualities of perseverance (wanting to do best for the people), humility (understanding the crisis and allowing people to take decisions based on their requirements, hence encouraging overall development), and critically thought decisions (implementation of ownership-based model, even though there was no precedence).

### 3. Farmers and ITC: a tale of symbiosis

In 1999, in spite of high market demand for soybean, the farmers faced poverty. The government legislation promoted authorised traders who acted as middlemen between exporters and farmers. These traders began exploiting the farmers' illiteracy and sunk efforts of travelling 50 km to the trading outlets, which deprived farmers of their deserved price [7]. Thin profit margins stipulated

Cost element	Conventional market	e-Choupal
Trolley Freight to Mandi	100	Nil
Filling & Weighing Labor	70	Nil
Labor Khadi Karai	50	Nil
Handling Loss	50	Nil
<b>Sub Total</b>	<b>270</b>	<b>Nil</b>
<b>Processor Incurs</b>		
Commission to Agent	100	50
Cost of Gunny Bags	75	Nil
Labor (Stitching & Loading)	35	Nil
Labor at Factory (Unloading)	35	35
Freight to Factory	250	100
Transit Losses	10	Nil
<b>Sub Total</b>	<b>505</b>	<b>185</b>
<b>Grand Total</b>	<b>775</b>	<b>185</b>
As % of Beans Value	8%	2%

**Fig.2**

*Influence of e-Choupal on costs of ITC*

farmer suicides. This adversely affected the supply chain. ITC revolutionized the Indian agricultural sector by introducing the e-Choupal initiative, which gave weather forecasts, vital information about correct farming practices and the current price levels in the market. ITC sought special permission from the government to purchase goods directly from the farmers, thus eliminating the middlemen. This ensured efficient cost-cutting as shown in **Fig. 2** [8]. Critical thinking, perseverance, humility paid them trust and respect from farmers alongside surging profits.

farmer suicides. This adversely affected the supply chain. ITC revolutionized the Indian agricultural sector by introducing the e-Choupal initiative, which gave weather forecasts, vital information about correct farming practices and the current price levels in the market. ITC sought special permission from the government to purchase goods directly from the farmers, thus eliminating the middlemen. This ensured efficient cost-cutting as shown in **Fig. 2** [8]. Critical thinking, perseverance, humility paid them trust and respect from farmers alongside surging profits.

### 4. The Redbull Stratos Project: Optimum use of digital media

Instead of direct marketing, Redbull hired Felix Baumgartner, skydiver to jump from the stratosphere to the earth. Everything visible on screen right from his craft, his suit, his parachute, had Redbull logo on it. Redbull spent 1/10th of the annual global marketing budget (\$330m) [9] The unique stunt went viral on all social media

platforms and Redbull got incredible visibility from this experiment. The event was shown on nearly 80 TV stations in 50 countries. The live webcast was distributed through 280 digital partners and racked up 52 million views, making it the most-watched live stream in history. There were 8 million viewers on Youtube[9]. The next two quarters, Redbull saw a 7% increase in revenue and a \$1.6bn sales. That was a 13% increase from the prior year and many regions saw jumps of double figures.[8] GaryVee writes: "Content is Fire, Social Media is Gasoline; If



you know well to light it, your business will explode beyond your imagination.”[10]. Amazing example of critical thinking making way to rise of business.

### Conclusion

It is imperative that entrepreneurs of today's generation shepherd the firm dynamically from the front and assess closely the micro-aspects of the market and their business model. The business acumen and risk-taking ability of entrepreneurs determines whether it rises to glory or plummets to ashes. Technological advancements must be incorporated, and new innovations evolved. Leaders should be humble, dedicated, perseverant, determined and resilient to work with the team of happy hardworking workers that are very productive and vital for the company, whereas an optimistic long-term approach to decision-making is a key quality of entrepreneurship. The three qualities discussed above would lead to impactful leader with agile minds and compassionate heart. This will lead the business to grow with integrity and bring success to all concerned.

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## EMPLOYING COMPUTATIONAL SYSTEMS AND NETWORKS IN PREDICTION AND MODIFICATION OF DISEASE GENES TO INCREASE IMMUNITY

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### Abstract

This paper reviews modern computational network-based techniques, specifically network diffusion methods, in prediction of disease genes, as well as mechanisms being used to modify disease genes to ultimately increase immunity against fatal diseases and disorders. It explains computational network diffusion approaches in disease gene prediction, analyzing their benefits and limitations. The paper next examines the Clustered regularly interspaced short palindromic repeats-CRISPR-associated proteins (CRISPR-Cas) system, a breakthrough in the genetic modification sector, and its use in genetic modification of disease genes. Showing why network-based strategies and the CRISPR-Cas system are currently the vanguard of this sector, it concludes by suggesting further unique possible routes for study and improvement.

**Keywords:** *network diffusion methods, disease genes, genetic modification, CRISPR-Cas*

### INTRODUCTION

The possibility of being equipped with the ability to completely curb life-threatening diseases to humans is extremely inspiring. However, the prediction and modification of disease genes has been an onerous mission for researchers. This paper explains achieving this efficiently in two steps: 1. Disease gene prediction and 2. Use of genetic modification in correcting disease genes. A disease gene can be defined as the 'defective' gene that goes through a mutation to cause disruptions in the cell system and so the disease. Usually, a group of disease genes malfunction to cause a disease. Nearly all diseases involve some genetic malfunction. Essentially, biomolecules in cells always carry out their functions in convoluted pathways, involving many chemical interactions and reactions. Portraying the pathways in a network format would not only be easier to understand, but also track disruptions in them because of various influences. Hence, the use of network-based systems with the assistance of computational systems and software at our disposal is a preferable option. These networks basically consist of 'nodes' representing the object and 'edges' representing the links between them. Complex algorithms in the system would allow missing nodes or edges to be deduced, leading to the prediction of unknown disease genes that cause  $x$  diseases ( $x$  being the name/type of disease). Protein-Protein Interaction (PPI) networks are currently most used to study the relationship between them. This paper goes on to examine and compare modern computational network diffusion type techniques in disease gene prediction. The second part of this research paper examines the modification of disease genes,



combining concepts of genetic modification and gene therapy, to essentially ‘correct’ them and prevent life-threatening diseases. Genetic modification is the editing of the genetic composition of an organism. Arguably the cheapest, quickest and most accurate system for editing genes is the Clustered regularly interspaced short palindromic repeats-CRISPR-associated proteins (CRISPR-Cas) system, explained in section ‘CRISPR-Cas for genetic modification’ later in the paper. CRISPR-Cas was first found in prokaryotes, as an active immune system to defend against foreign virus enemies. This paper explains how the CRISPR-Cas systems work and how computational systems are supporting them to contribute to advancement in genetic modification to enhance human immunity.

## Theory

### **Analysing PPI networks to predict disease genes**

Proteins play a vital role in the cellular and molecular reactions of our body to keep us healthy. The nature of these protein “interactions” is such that they can be displayed as a network structure to show how a certain biological function is being performed. So, a particular PPI not taking place because of a faulty protein or other disease-causing factor would be identified by the system. This could be shown by an edge/node removal in the network[1]. Additionally, the topology i.e. the way different protein molecules are connected in the network and the overall patterns that emerge out of this, is an integral feature of PPI networks. Hence with the help of computational systems and network theory, PPI networks can be integrated with disease-gene networks to unearth new disease-gene associations.

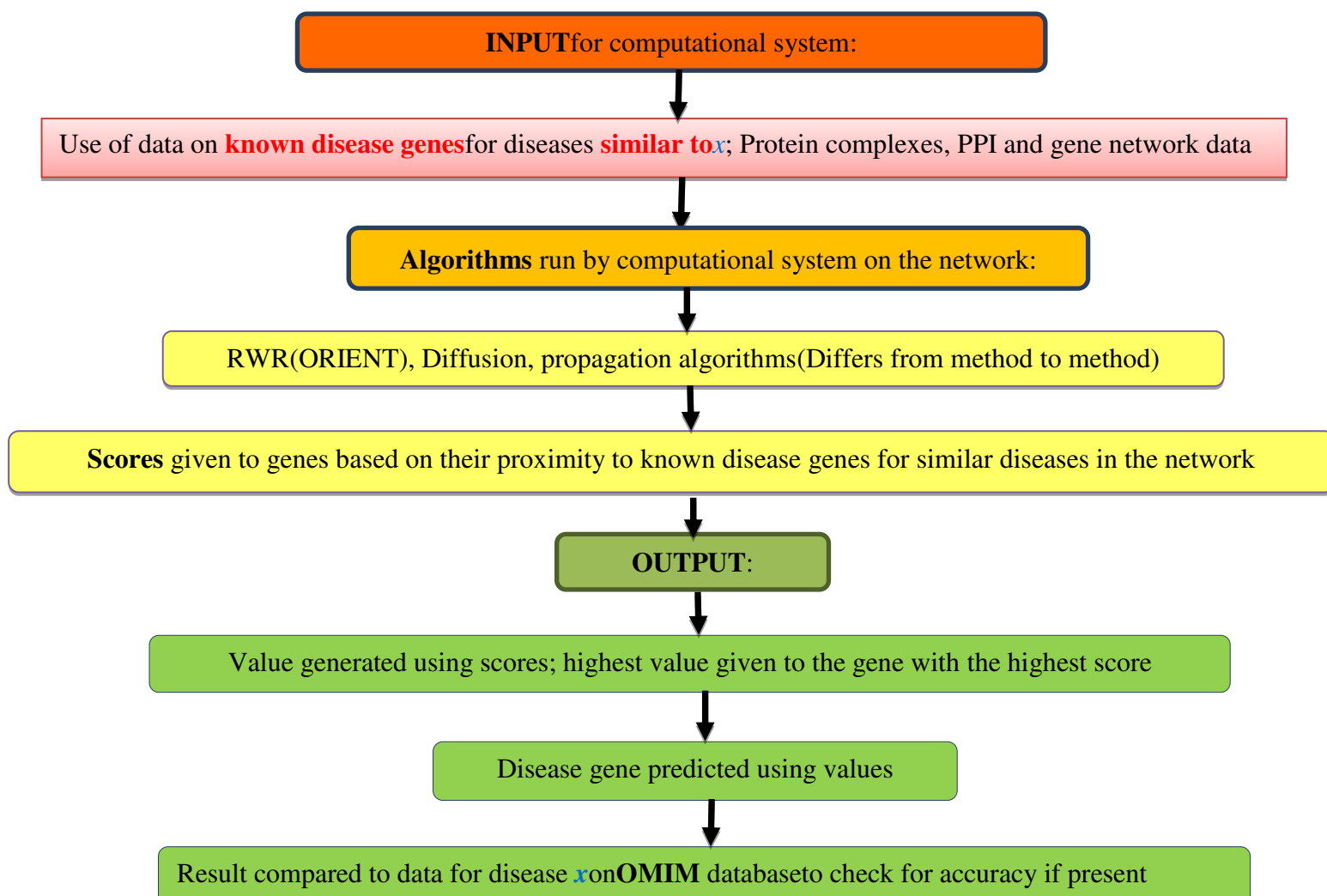
### **Existing network diffusion methods for disease gene prediction**

Diffusion or propagation in a network can be thought of as spreading or travelling of biological data across its edges. Computational systems are arguably the best choice to construct and monitor them due to the vast amounts of data. There have been various network diffusion-type techniques created in this decade that try and predict disease genes using this principle. PRINCE[2] is one such method that uses PPI networks to infer disease genes. Designed by Vanunu O et al., PRINCE uses prior data on known disease-causing genes for similar phenotypical diseases to the one in question. Then using a diffusion-based algorithm it gives scores to the candidate genes in the network. This scoring is done based on the proximity of the candidate gene to a known disease-causing gene for a similar disease. So, the closer the candidate gene to the disease-causing gene, the higher the score. It also can infer the protein complexes involved in that disease. VAVIEN is another method that assigns scores to proteins based on their topological properties using a random walk algorithm. A ‘walk’ in network theory is going along a sequence of adjacent nodes through the edges connecting them to reach a desired destination. ORIENT uses a RWR (Random walk with restart) algorithm (walks but with the ability to stop and restart from another node) to assign scores in the form of ‘weights’ to the edges through the shortest path from a candidate gene to the known disease gene. Fig 1. shows the basic steps and framework that all these network systems follow to obtain a result for the disease-causing genes of the disease  $x$  in question. These results were compared to those in OMIM (Online Mendelian Inheritance in man), the global catalog for diseases and genes.



### Limitations and further possible areas for research

Network diffusion methods are all highly dependent on prior data of known disease genes for similar diseases (highlighted in red in Fig 1.). So, in cases where the disease in question has no other phenotypically similar diseases, it may be much more challenging to predict disease genes for the disease. The data that is actually there to work with is quite limited, which poses study limitations [1]. The reliability and “completeness” (they are still dependent on known disease-gene associations giving rise to bias) of the PPI and gene networks is also influential in determining the position and scores of genes in the network, so it has a direct impact on the results obtained. It is necessary for scientists to address these hurdles for improving accuracy of these models. A future prospect could be to try and use a combination of PPI and gene networks and machine learning to predict disease genes more accurately. By doing this it would be expected ideally that problems of incomplete networks get eliminated and all methods are combined into one. Such a method could be devised that current existing knowledge of known disease genes is used to the fullest by the system without any excessive bias [1] shown in the results because of them.





**Fig 1.** A flowchart summarising the common key steps taken by network diffusion-based computational systems to discover disease genes for disease  $x$  (the disease in question).

### CRISPR-Cas for genetic modification

The working of the CRISPR-Cas immune system in prokaryotes is explained in detail in [4]. However, recent research has proved that CRISPR-Cas systems can be used to serve other purposes too. The four main steps to modify disease genes using CRISPR-Cas9 are listed below:

- 1) Scientists construct the custom guide RNA, complementary to the DNA sequence in the disease gene they want to edit.
- 2) The guide RNA is made to bind with extracted Cas9 nuclease and form an artificial effector complex.
- 3) Effector complex is inserted in the organism's body and makes the cut at the required site.
- 4) Using HDR (Homology Directed Repair - a template is given by scientists)[3] the cut is repaired and new DNA made; disease gene corrected into a healthy gene and immunity is enhanced.

Novel computational systems have been freshly created to aid scientists in steps 1) and 4) above. CHOPCHOP, CRISPOR and CRISPRscan are three guide RNA designing web-based computational tools created to:

- 1) Design, evaluate and clone guide RNA sequences as asked by scientists
- 2) Create predictive models showing positions of targeted genes
- 3) Searching for off-target impacts and sites where unintended changes may happen
- 4) Be compatible with a wide variety of genomes, easily create genome-scale "libraries".

### CONCLUSION

To conclude, disease gene prediction and modification is of utmost importance to be able to upgrade human immunity against severe diseases that threaten our population. Computational systems in disease gene prediction and genetic modification have tremendously played a key role in augmenting our knowledge. But there is still a long way to go in improving PPI networks' reliability and network diffusion models' accuracy and efficiency. With the assistance of rapidly advancing computational resources, it is hoped that we will soon be able to perfect and use these methods as a way of saving lives affected unfortunately by disease.

### Acknowledgements

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### COMPUTATIONAL MODELLING IN PRECISION MEDICINE- DIGITAL TWINS

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#### **Abstract**

First proposed by Grieves in 2002, digital twins are a form of computational modelling and simulation used to virtually represent complex systems. Meanwhile, precision medicine intends to develop treatments and preventive measures, considering the diversity in patients. This paper showcases the contributions made by digital twins to the development of precision medicine due to their ability to accurately represent biophysical systems. Based on suitable examples, the paper discusses the merits of using digital twins in precision medicine therapies. This paper also highlights the required changes in contemporary healthcare and society to truly reap the benefits of digital twins.

**Keywords:-** *'Computational Modelling', 'Precision Medicine', 'Digital Twin'*

#### **INTRODUCTION**

##### Computational Modelling and Simulation

Computational modelling and Simulation is the use of computers to study and adjust complex systems with numerous variables using an algorithmic or mechanistic approach while observing the outcomes. Due to the inherent complexity of biological systems, the development of computational models is intrinsic to achieving a quantitative understanding of their structure and function in health and disease. The thousands of computer experiments identify the handful of laboratory experiments that are most likely to provide a solution to the problem under study, thus saving time and resources.

##### Precision Medicine

According to statistics reported by the FDA in 2013, 38% to 75% of patients received ineffective medicines, for numerous conditions from depression to cancer. This is because the variabilities among patients who receive a similar prognosis are not considered. Precision medicine is an innovative approach to customising disease prevention and treatment that takes into consideration the differences in the genes, environments, and lifestyles of people. It aims to provide treatments that reduce the exposure of patients to adverse effects of unnecessary diagnostic testing and therapies and shift healthcare from disease management to disease risk prevention. Large-scale assembly of bioinformatics datasets from a variety of sources sets the stage for a powerful precision medicine ecosystem. Emerging computational techniques such as machine learning and artificial intelligence is essential for the optimal usage of these datasets.

### Theory: Digital Twins

In 2002, Michael Grieves introduced the initial conceptual model of digital twins in manufacturing management under the names ‘Mirror Space Model’ and later ‘Information Mirror Model’. A digital twin is a virtual model of a physical object, process, or service that dynamically pairs the physical and digital worlds. It leverages modern technologies, such as smart sensor technology, data analytics, and artificial intelligence (AI) to facilitate rapid testing and explore innovative opportunities. Contemporary scientific knowledge and simulation capabilities enable digital twins to be constructed for modelling various aspects or functions such as protein structures of the human body. By utilising electronic medical records of individual patients and patient-generated data, digital twin technology can also empower precision medicine research in understanding drug interactions, treatment efficacy and procedure safety. Integration of artificial intelligence and advanced analytics enables digital twins to predict how an object or process will perform with heightened accuracy.

### DISCUSSION

#### Applications of Digital Twins

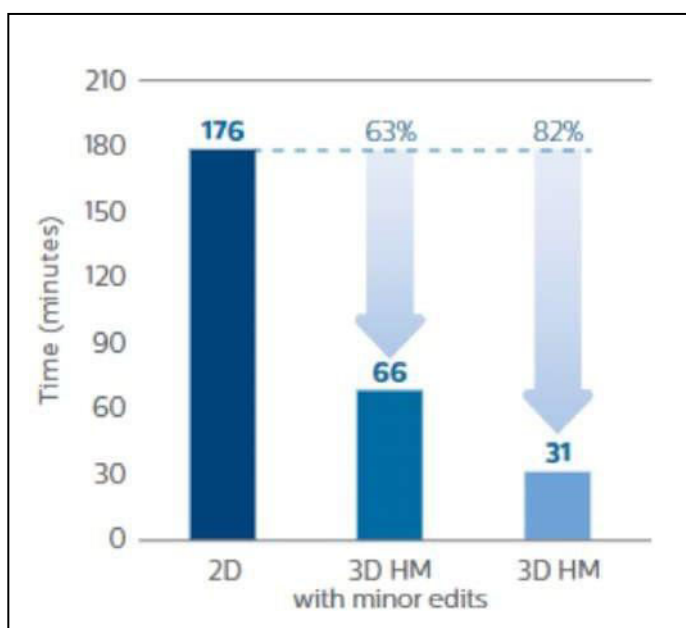
##### 1) Orthodontics:

In a study Cho et al. demonstrated the use of digital twins in the provision of suitable orthodontic treatment to Korean adult females by examining their facial profiles using facial scans and three-dimensional (3D) imaging (cone-beam computed tomography, CBCT). These treatments took into account the differences in the facial structures of Korean and Caucasian patients, thus increasing the efficacy of the treatments.

##### 2) Cardiology:

Fig. 1: Time taken to complete Left Ventricle and Left Auricle measurements using Philips HeartModel (HM) in comparison to 2D imaging and biplane method of disks.

The usage of ‘cardiac digital twins’ in precision cardiology is another notable example. The ‘Living Heart Project’ by Dassault Systèmes unites cardiovascular researchers and clinicians to develop highly accurate digital human heart models. The Philips HeartModel transforms a person’s two-dimensional (2D) scan (using the company’s ultrasound equipment) into a full-dimensional model of their heart, enabling users to manipulate the virtual heart model. By producing computational heart models and simulating various pacing strategies on them, Steven Niederer’s group at King’s College London could identify the ideal area to electrically stimulate the heart and investigate the effects of changing he pacing.





### 3) Multiple Sclerosis:

The creation of digital twins for patients with multiple sclerosis assists in the provision of optimal intervention therapies and strategies while considering side effects and environmental factors. Due to the heterogeneity of the disorder and its course, vast amounts of data have been collected, presenting good opportunities for data-driven approaches such as the usage of digital twins.

### **Contributions of Digital Twins**

Digital twin technology aims to replace (at least partially) the usually expensive and resource-intensive laboratory experiments with in-silico simulations. Collaboration among mechanistic and statistical models has shown to aid diagnosis, treatment, and prognosis evaluation. A fully developed digital twin will combine population and individual representations to support new hypothesis generation and clinical decision making and could supply doctors with vital information regarding information otherwise inaccessible through conventional experiments. This includes data concerning heart stiffness and potentially cancer prognosis.

### **Drawbacks of Digital Twins**

Data needed for a digital twin is preferably harnessed by wearable sensors and lifestyle information registered by patients. A notable challenge is the integration of this data with healthcare organisations as security and confidentiality are intrinsic to address concerns when handling personal data.

Secondly, it is of great importance to provide accurate assumptions to the model; both models relying too heavily on a vast amount of data and basic-as-possible models, can yield unreliable results. Another key barrier is the absence of supporting IT infrastructure, lack of data standards and interoperability, insufficient decision support technology, and insufficient funding for translational health research.

### **CONCLUSION**

Precision medicine is a field requiring the analysis of large amounts of data from complex systems in order to provide efficient treatments while taking into account the diversity in patients. Computational Modelling in Simulation, specifically digital twin technologies, can greatly assist the development in this field while reducing the cost and time taken for procedures. To accelerate the development of precision medicine using in-silico technologies, it is essential to build trust among researchers, clinicians and society. Alongside this transparent exchange of information, the development of IT in healthcare is critical to the integration of computational modelling and simulation and precision medicine.

### **ACKNOWLEDGEMENTS**

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### USING DRONES AS AN ALTERNATIVE TO PRESET TRAFFIC SYSTEMS AND SURVEILLANCE CAMERAS

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#### Abstract

This paper proposes unmanned aerial vehicles, or drones, as an alternative to surveillance cameras and traffic systems which depend on pre-set time or manual operations. It is a 10-year plan to implement the idea in most metropolitan cities in India, which is divided into two halves, with major traffic system changes initially, followed by additional advantages if the plan is successful. The plan is comparatively cheaper than having 5-6 surveillance cameras and a traffic system, since it combines the two. Not only does it use AI to do most of the work, it ensures that unemployment rates do not rise. It does not completely replace traffic police as it requires them to be present as supervisors.

**Keywords:** *traffic systems, drones, artificial intelligence, motion sensor, efficient traffic flow*

#### INTRODUCTION

The current traffic signal system used in most metropolitan cities in India relies on a fixed time operation system, where the timing for each signal is pre-set [1], lasting for 2-4 minutes. This means that there is a high possibility where in a junction there is one side with a green signal, but another side with a red signal lasting for two and a half minutes, and a huge line of cars constantly honking, which is the reason behind the idea proposed. To make this problem better, traffic police are stationed at the congested junction during peak hours to ease the flow of traffic. However, this does not always seem to work. The idea proposed in the paper combines various high-tech systems balanced with manual surveillance to achieve maximum possible efficiency to ensure the traffic in major cities flows better.

#### Theory

According to the Tom Tom Traffic Index, Mumbai was the most congested city in India, and the fifth-most congested city in the world in 2021 [2]. According to “The Great Reset”, a book by Richard Florida [3], building greater, wider roads does not help in reducing traffic, as it only encourages drivers to commute more often as the travel time is reduced. About 5-6 ANPR (automatic number-plate recognition) cameras are installed at junctions which measure the average speed of the motorists, and an e-challan is issued after a manual approval at the traffic control room [4]. However, these systems have not drastically affected the traffic systems, and are relatively expensive. The proposed plan is about using drones: one at each big junction. The drone consists of a camera which provides a 360-degree view of the crossroads to analyze the traffic, which will be connected to traffic signals to control the signals according to the traffic





levels rather than having a fixed time for all signals. The camera will also use the ANPR technology in order to identify various vehicle types, their speeds, classification etc.

### Experimental

For the first 5 years of the plan, a hybrid drone system will be used. The drone will use a radar based camera with a visual range up to 6 lanes in all directions. This camera will be used as a probe to analyse the live traffic levels at a junction, and the AI system will be programmed to analyse the road traffic on all sides and make a decision which will be then displayed on the traffic signals. A black visor will be added to protect it from extreme weather conditions. The drone will fly at a height of 20-25 metres, and 15-20 metres in the 12km airport range [5]. It will be able to view up to 300-400 metres in all directions. A smaller camera will be installed below the main radar camera which will consist of an ANPR system to identify the vehicles, calculate their speeds, vehicle classification, prediction of lane change, etc. The system will give priority to sides with greater traffic and give that path a green light. In the case of no cars in the junction, all the lights will turn red to ensure complete safety, and only turn green if a car is detected. The cameras which are in a 1km range of each other could be connected and coordinated to make traffic flow even smoother, so the car doesn't have to stop at every junction. It will also detect over speeding, not wearing helmets, unnecessary honking, breaking signals, wrong parking and other traffic-related crimes. However, for India, employment is extremely crucial, so instead of completely replacing humans in controlling traffic, a hybrid system will be implemented where the drone is accompanied by a traffic police officer. The detection of traffic related crimes will be linked to the E-Challan system where the recording will be sent to the traffic control room for a manual approval before the challan is issued. This also reduces corruption rates as the tax is linked to the bank account and supervised by various heads rather than a few police officers. In case the E-Challan has not been paid even after several warnings or the amount due has exceeded a set limit, the license could be suspended for a particular time period. The drone can automatically control the signal during low traffic periods, but if the traffic is high, there is a risk of glitch/failure in the system as it may get confused. Since this is a matter of lives, during the peak times the drone will only make suggestions to the controlling device operated by the officer, who will be supervising the traffic and will approve of the decision made. Moreover, since the camera has a high visual range, it can detect car motion long before it reaches the junction. This allows the camera to detect ambulances, fire brigades and police cars long before they are manually spotted, and can clear the road for the high-priority vehicles in the case of emergencies. The high visual range could also alert the police if any suspicious criminal activity is detected, rather than having the police spot suspicious activity and stop the cars. The reaction time of the police as well as the drivers could affect this, and criminals might get away. If the police are alerted well in advance, it could really help find criminals trying to escape as the drone also measures speed and prediction of lane change. These factors could be used to predict the probability of an accident/criminal running away, and allow the traffic police to stop all the vehicles at the junction, making it easier for police to chase them. Public transportation like buses could be given second priority so that they stick to their schedules since more than 60% of Indians use public transportation as a way to commute [6]. A system that was recently tried in Thane [7] could be adopted and added to the proposed traffic system wherein the duration of the red light increases if the noise pollution at the junction exceeds a particular range. This will



encourage the citizens to honk less, since all the metropolitan cities almost always violate the noise pollution standards. In case this plan succeeds in the 5 years, smaller but significant changes and additions could be made such as using LDRs and logic gate systems to turn on street lights when it gets darker.

Google Maps currently relies on historical traffic data or manual updates to display the traffic levels. To increase the accuracy, the system could be connected to Google Maps or car GPS systems to give a live update on traffic. It could also detect potholes and update the officials in charge.

### DISCUSSION

There are various challenges when it comes to implementing such a complex system in a developing country. Using AI could cause a lot of people to lose jobs, which is not beneficial for India's development. The hybrid system ensures that the jobs are intact, and development is happening simultaneously. Extreme weather conditions such as wind could really affect the functioning of the drone, so the composition of the material will be planned accordingly. Even though a drone system may seem extremely expensive (considering the cost of developers, the drone itself and multiple cameras), it is relatively cheaper in the long run as it only requires an installation cost and has all in one features, unlike the current system where there is a different system for each requirement. The road tax could also be increased by 1-2% in case the funds provided are not enough.

### CONCLUSION

The proposed plan consisting of 2 parts combines various systems used in the functioning of traffic into one, and provides efficient solutions to various problems such as traffic congestion, noise pollution, corruption, prioritizing safety, saving fuels (since India mainly relies on petrol and diesel and the rate at which the fossil fuels are being used up is at an all-time high).

### Acknowledgements

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### FORENSIC ACCOUNTING- AN EXCELLENT DETERRENT TOWARDS FINANCIAL FRAUD

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#### **Abstract**

This report presents a forensic accounting theory. Forensic accounting theory is an explanation of why and how the choice of methods and techniques used to detect creative accounting or fraudulent manipulations in financial reporting and the outcome of using such methods or techniques depends on the accounting and non-accounting decisions taken into consideration by the forensic accountant or invigilator. The forensic accounting theory developed in this paper is useful to both practitioners and academics, and the resulting contribution to accounting theory and forensic science are useful to the problem-solving process in the global fight against financial crime.

**Keywords:** Financial fraud, Audits, Forensic Accounting, Forensic Accountant, Fraud, Accounting, Corruption

#### **INTRODUCTION**

A forensic accounting theory is an explanation for observed forensic accounting practices. Past and recent accounting scandals in financial and non-financial firms have shown that expertise in forensic accounting is crucial to detect financial fraud that originates from a firm's financial accounting process. Moreover, it utilizes accounting, auditing, and investigative skills to conduct an examination into the finances of an individual or business. Forensic accounting provides an accounting analysis suitable to be used in legal proceedings. Forensic accountants are trained to look beyond the numbers and deal with the business reality of a situation. Forensic accounting is frequently used in fraud or embezzlement cases to explain the nature of a financial crime in court[2]. A rise in the innovation of forensic fraud schemes and companies ceaselessly changing their accounting processes has not only increased frauds but has also increased corruption, one of the major causes behind financial crimes. Corruption is a form of dishonesty by a person or organisation who is trusted. Anti-Corruption Unit of various countries hire quick-witted forensic accountants to detect corruption in profuse companies so that financial frauds can be reduced.

#### **Theory**

Forensic accounting theory looks at how the accounting and non-accounting decisions made at the start, during or at the end of the investigation process affects the choice of forensic detection methods and techniques used, and the interpretation of the findings of forensic investigation. Frauds categorized as corruption are perpetrated by employees, against the organization, for the



benefit of the employee. For corruption to occur, someone on the inside has to work with someone on the outside in such a way that the relationship is a detriment to the organization [1]. Relationship between the employee and the organisation also plays an important role in deciding which employee is likely to get corrupted. An employee who is discriminated on the grounds of age, sex, religion etc is likely to get corrupted because he/she will have a feeling of hatred towards the organisation. Corruption will lead to poor growth of the company/ organisation because by taking money from someone the employee would be manipulating not only the company's accounts but other things like production as well. This gives rise to frauds in the long run. Not only companies, profuse insurance agencies are also facing corruption issue. Employees are often bribed by the customers who then manipulate their personal records and exploit the insurance agency on the basis of information failure and moral hazard. In HAITI, a country which is in the Caribbean, the Anti-Corruption Unit has targeted 36 public enterprises for compliance investigations. It also uncovered a widespread HTG 100 million corruption scheme in the National Office for Old Age Insurance and, as a result, the agency's executive director has been jailed [4]. The number of banking fraud cases involving 1 lakh and more is on the rise which has increased to 5076 in the fiscal year ending March 2017, from 4235 in 2012-13. As many as 22,949 cases of fraud in both public and private banks came into light. This shows that the demand of forensic accountants is increasing day by day in India [3].

### DISCUSSION

In the chart below there is an illustration of the amount of pending fraud cases from each of the fiscal years from 2007 until 2011. These are corporate fraud cases taken on by the FBI. This is by no means an exclusive number as there are many other types of fraud as well as other agencies and Forensic Accounting teams taking on cases. The chart does show that the amount of fraud cases per year is rising ("Fraud report to the public," n.d.). Therefore the demand for Forensic Accountants is also rising [5].





An increase in technology has given birth to profuse ways of corruption and fraud but at the same time forensic accountants also find it easier to detect the frauds. Moreover, advancement in technology gives them access to innovative tools which they can equip to find frauds much easily.

### CONCLUSION

In this paper, I discussed forensic accounting theory and why few gluttonous people get bribed. Moreover, corruption is one of the major reasons for financial frauds around the globe because without the help of any company's employee it is practically impossible to commit a fraud because the internal information of any company/organisation is with the internal staff only. Forensic accountants carry out a treacherous task to find the reason behind which fraud has occurred by rigorously going through the audits, accounts and other information like relationship with stakeholders to find the major roots of the fraud. Every year financial crimes are reaching new heights, thus making the work of the forensic accountant much more difficult but they are doing a tremendous task to detect frauds. Until corruption does not reduce, financial frauds will not reduce. Forensic Accounting is truly an apt way to reduce and control financial fraud.

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Pg 13



### ANALYSIS OF WEARABLE SENSOR SYSTEM RELIABILITY IN THE MONITORING OF EPILEPTIC SEIZURES

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#### Abstract

The objectives of this paper are to review the existing wearable sensor systems used in seizure monitoring and determine the system reliability, while also suggesting a standardized reliability evaluation model for the systems. Research is purely a literature review and is focused on evaluating the seizure monitoring system based on the rate of false alarms.

**Keywords:-** *Wearable sensors, Epilepsy, Accelerometry, EEG and ECG based seizure detection methods, electrodermal systems, Generalized Tonic-Clonic Seizures*

#### Introduction

Wearable sensors refer to any 'wearables' that may be strapped onto the body or are weaved in with clothing. Evidence of wearable sensors use in healthcare monitoring dates back to the 1980s. Epileptic seizure management aided solely by medication is still a struggle, and it is believed that wearable sensors based monitoring could improve the providence of healthcare in this case. While the idea of wearable sensors in healthcare usually just brings to mind the Fitbit and other devices like the apple watch, several more specialized methods exist for seizure, especially epileptic seizure, monitoring. The paper will first analyse the functioning of the systems in place and then evaluate reliability in the results section by taking into account FPRs (false positive rates) and other measurements of each system's reliability. Discussion is necessary since some of the difficulties in managing treatment-refractory epilepsy can be ameliorated by the ability to detect clinical seizures [5].

The fact that diagnoses and treatment are to be reliant on data collected through these wearable sensors the data they yield must be accurate, valid and relevant.

#### Theory

Over the past few decades, several different wearable sensor systems have been put into practice in the monitoring of epileptic seizures in a hospital environment. The following section will discuss and describe at length each of the 3 most popular systems. The content will be limited to the functioning of each of the systems.

##### I. Accelerometry

This is a widely used monitoring system. It involves the use of a wrist-band accelerometer device which works by detecting vibrations to measure the proper acceleration of a body. Three-dimensional accelerometric devices are the preferred ones, of which the Empatica Embrace wristbands are the first commercially available multimodal wristbands that were designed to notice physiological markers of ongoing Generalized Tonic-Clonic Seizures [5]. The devices work by identifying accelerometric and electroencephalographic signatures of a grand mal seizure caused among epileptic patients. The data is then transferred to a mobile phone via

Bluetooth where the data can be accessed by caregivers and medical professionals. Identification of GTCS risk is especially important as it is one of the leading causes of SUDEP and helps to draw out individual care plans to prevent a fatal episode to the best of the healthcare provider's abilities.

### II. ECG and EEG based seizure detection systems

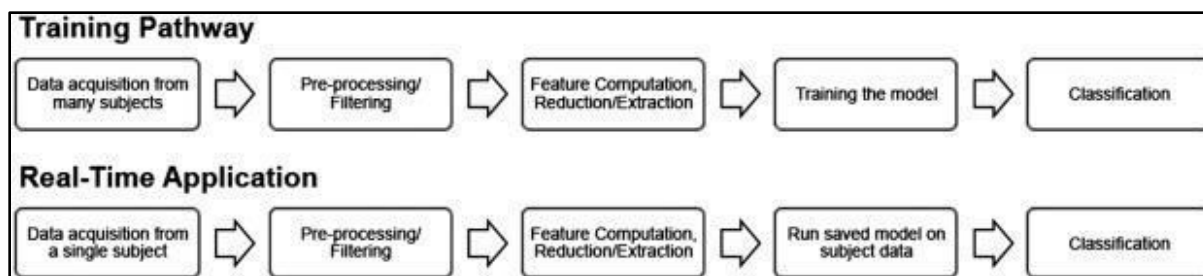
Epileptic seizures occur as a result of abnormal brain activity, so it is only rational to include Electrocardiogram and Electroencephalogram based sensors as part of their detection and analysis. The combination of EEG and ECG works by using physiological changes that happen before or during a seizure or an epileptiform discharge to activate an electromagnet worn as a wearable sensor by the patient. In this case, this is done through heart rate monitoring and brain activity tracking also using wearable wireless biosensors.

### III. Electrodermal systems

EDA or electrodermal activity is another factor that is monitored among epileptic patients. The wearable sensors developed for this, work by tracking the modulation in skin conductance to account for the exclusively sympathetic activity in the body [9]. The theory behind the devices monitoring EDA is that the skin conductance is disturbed by seizures, especially GTCS ones. This works because during a seizure the skin conductance drops and there is a notable increase in EDA. The wearable sensors are placed in the form of electrodes in a band that is to be worn on the forearm. The battery packs are changed every 24 hours, and EEG and ECG monitoring systems are also in place to provide the seizure locator and semiological data.

All the wearable sensor systems shared the data collection pathways highlighted in the picture below, which has been taken from a study.

Fig. 1 [5]



## Result

### I. Accelerometry

In the case of the Empatica Embrace the sensitivity is 94.5 % while the false alarm rate is 0.2 per patient per day [3]. While the rates are quite promising we cannot completely trust the data. The wearable sensors are adept at identifying shaking that may result from a seizure, but it does not take into account the other indicators or even seizures of different kinds that are not generalized. As described in a paper 'accelerometers are subject to occasional technical and user-induced failures, and do not currently detect seizures lacking rhythmical shaking' [6]. Furthermore, another study quoted that during 36 hours 897 seizures occurred, of which 48% were accurately detected by accelerometric wearables, and that the detection was higher than what would have been otherwise reported by medical practitioners.

### II. ECG and EEG based seizure detection systems





The results of such seizure detection systems showed that the EEG system was able to accurately detect 92% of seizures and  $0.2 \pm 0.7$  false alarms per hour [2].

### III. Electrodermal systems

The first analysis of reliability is based on the data obtained in an experiment published in the paper: Continuous Monitoring of Electrodermal Activity During Epileptic Seizures Using a Wearable Sensor. The study's results showed that the wearable sensors were able to detect seizures through EDA accurately and the data also differentiate GTCS and CPS. The statistical comparison of EDA during CPS and GTCS was done using the Wilcoxon rank-sum test, p values  $< 0.05$  were identified as important.

As a consolidated conclusion of the analysis of the reliability of the most commonly used wearable sensor systems, I felt it necessary to include the table below, which is from the paper 'Seizure Diaries and Forecasting With Wearables: Epilepsy Monitoring Outside the Clinic,' [3].

Table 1.

Study	Device	Signal(s)	Environment	Seizure type	Patients (seizures)	Sensitivity (%)	False alarms per day
Beniczky (56)	IctalCare EDDI	EMG	EMU	GTCS	71 (32)	93.8	0.67
Halford (57)	BrainSentinel SPEAC	EMG	EMU	GTCS	199 (46) 149 (29) <sup>a</sup>	76 100 <sup>a</sup>	2.52 1.44 <sup>a</sup>
Onorati (49)	Empatica E4	ACC,EDA	EMU	GTCS	69 (22)	94.5 <sup>b</sup>	0.2 <sup>b</sup>
Vandencastele (58)	180° eMotion Faros	EKG	EMU	CP (FT)	11 (47)	70	51.6
	Empatica E4	PPG				32	43.2
Johansson (59)	Shimmer3, custom device	ACC	EMU	TCS	8 (10) <sup>c</sup>	100 <sup>b</sup>	1.2 <sup>b</sup>
Heidberg (51)	Empatica E3	ACC, EDA	EMU	Multiple	8 (55)	89.1 <sup>d</sup>	18.1 <sup>e</sup>
Jeppesen (60)	ePatch	EKG	EMU	Focal, GTCS	43 (125) <sup>f</sup>	93.1 <sup>f</sup>	1.1 <sup>f</sup>

### Conclusion

Research has shown that the initial hypothesis that the wearable sensors used in epileptic seizure monitoring are not very reliable is untrue. The wearable biosensors available are shown to have good accuracy rates and have significantly aided the providence of good healthcare. Wearable biosensors are not only enabling around the clock monitoring but also improving quality of life and possibly even reducing chances of SUDEP.

However, if we apply the false-positive rates to real-life numbers there are still a lot of discrepancies and the number of patients not receiving reliable data is still high. Accelerometric is efficient and accurate, but it does not differentiate between seizures or help with locating origin either. EEG & ECG systems and EDA monitoring systems do not allow for as much mobility. Technological advancements should be encouraged through funding.

Even though similar data was gathered from each of the wearable sensor systems we must note that there is no standardization in the way we can analyse reliability. It is easy to evaluate an individual system's reliability, but hard to compare it with the reliability of other. The checklist provided at the conclusion of the paper 'Recommendations for Assessment of the Reliability,



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Sensitivity and Validity of Data Provided by Wearable Sensors Designed for Monitoring Physical Activity should be considered for standardization.

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### CRUISE CONTROL AND ACCIDENT PREVENTION

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#### Abstract

This research paper aims at analysing the current cruise control technologies present in road vehicles, and how they can be improved to avoid accidents and damage to vehicles and lives. It compares the usage of these automated technologies to those in airplanes and other airborne vehicles, to analyse how the systems of ground vehicles can be improved to come closer to the advanced systems of airborne communication systems, while keeping the costs under control to make it accessible to a wider range of the population. Cruise Control revolutionised the automobile industry, and it aims to make the roads a safer place to travel for each and every one of us, even today. This paper will analyse the different types of cruise control systems that are in current use, or are still being developed, and aims to put forth viable suggestions for solutions to any faults or shortcomings in the systems.

**Keywords:** *cruise control, accident prevention, airborne communication systems*

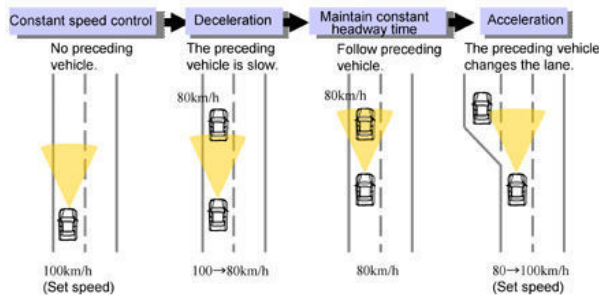
#### INTRODUCTION

In recent times, the usage and knowledge of the word “autopilot” in air transport systems has become increasingly common. While these automated systems were being developed alongside the very first airplanes in the 1910s, they have become increasingly advanced in terms of accident prevention, accuracy, and error correction. [1] Similar to this system, a much simpler version began to be implemented in road vehicles, specifically cars, during the mid-20th century. Called Speed Control, the system was known to maintain the car’s velocity at a set magnitude; to reduce the load on drivers during long journeys.

Cruise control in road vehicles is a concept that has been gaining momentum in the past few decades. Though it seems to be a modern invention, cruise control (developed by the American mechanical engineer Ralph Teetor) does have its roots deep in history. In fact, the first car with built-in cruise control hit the roads way back in 1948. Although the system was vastly tweaked and improved over the years, the fundamental concept remained the same. In fact, over 92% of the cars available right now have built-in Adaptive Cruise Control systems [4] (a system that will be elaborated upon in the paper). This concept interests me, because it is certainly a scientific breakthrough that we can now develop vehicles that cater to human safety as its top priority, and minimise fatal highway accidents worldwide. Currently, more than 1.3 million people are in fatal car accidents globally, and systems like these will help minimise that number to its greatest capacity, and help save precious lives around the globe.

### Theory

Traditional Cruise Control systems work by keeping the vehicle at a constant speed when the driver turns it on. Once the car has reached the desired speed, cruise control systems help maintain that speed to allow for a minor break or rest for the driver during the journey. However, this system would reset automatically the moment the driver set foot on the brakes, and hence didn't prove very useful on unpredictable roads. Due to the variables like other vehicles, pedestrians and turns, drivers would rarely be allowed a break before they had to slow down, stop or change direction. This led to the rise of several other advanced systems, including a few as follows:



**Adaptive Cruise Control (ACC):** Developed by William Chundrlik and Pamela Labuhn in 1990, ACC can do more than what others anticipated. Originally designed to improve the driving experience and therefore increase sales of cars, ACC goes one step ahead of the traditional

**Fig. 1 RADAR in ACC Mechanism.** Along with maintaining a set magnitude of speed, ACC uses RADAR systems to detect the speed of a

vehicle in front, and adjust the speed to prevent collisions and ensure a safe driving experience. RADAR systems emit radio waves which are reflected by the preceding car and are detected again by the RADAR system. By calculating the time taken between reflections, the RADAR system can accurately detect the speed of the preceding car, and will adjust the speed of the ACC to match the car, to maintain distance between the vehicles. However, this system does not in any way control steering so that must be supervised by the drivers themselves at all times for safety, just like in airborne autopilot systems. Currently in India, very few car models under 40 lakh INR are equipped with this feature.

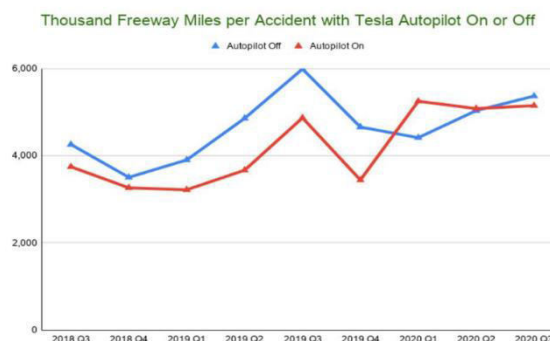
**Cooperative Adaptive Cruise Control (CACC):** Sensors like RADAR and LiDAR (Light Detection and Ranging) are not failproof, and can lead to fatal accidents if they fail. CACC aims not only to maintain a constant speed, but mainly to maintain a constant time gap between the preceding vehicle and the driver vehicle. [2] CACC systems also display the basic safety measures, such as position, velocity and acceleration which is updated at regular time intervals. [2] This concept is quite new in the field of communication systems for traffic surveillance, but development in the near future could allow for this technology to become more common.

**Traffic Aware Cruise Control:** Commonly known as Tesla Autopilot, this is one of the most advanced self-driving systems released to date. It is currently exclusive to Tesla models, and is resultantly an extremely expensive system to own. Designed to improve safety on roads, it is one of the first automated driving systems that includes steering and changing lanes. (lane assist) [6] Such advanced technologies were only available in airplane systems up until now, so this is a breakthrough in road traffic vehicles. This type of cruise control can detect vehicles in the same lane as the vehicle, and make necessary alterations.

Although these automation features have intrigued and excited the public, as they feel they may not have to drive for long harrowing hours anymore, these systems might just be too good to be true. In the following section we will discuss the hazards and threats posed by this system, how exactly they come into being, and what can be done to fix them.

### Experimental

As illustrated in this graph, the number of accidents per freeway miles were quite a bit higher when the Tesla Autopilot was on, between 2018-2019. It is a common misconception that once cruise control is turned on, the drivers can leave the system unsupervised. However, this would be extremely dangerous because if the system malfunctions, coupled with high speeds on highways, can result in innumerable fatalities. First of all, ACC systems, which are the most common, do not steer the cars and do not have the ability to manoeuvre through complex situations on roads involving intersections, pedestrians or other special cases. In this survey, I aim to reach out to the public and root out the exact opinions and knowledge the general people have about this system and how it should be operated, and then propose changes and possible solutions.



**Fig. 2 Accidents when Tesla Autopilot is on**

### RESULT

Public opinion on the usage and abilities of cruise control was gathered using a public survey linked as follows: <https://forms.gle/n3cqj724yYyfBko27>

The results are as follows: MISA RESEARCH RESPONSES (the emails have been blanked out for confidentiality) The results show that although the majority of the people may have never used this system first-hand, they are aware of the dangers and precautions to be taken, since many people have agreed it is dangerous to leave an automated car unsupervised. Follow this link for a pictorial representation of the results: SURVEY RESULTS (MISA 2022: CRUISE CONTROL) (annika davuluri)

### DISCUSSION

It can be inferred that the general public is aware of the hazards in the system, as shown by the fourth and fifth questions in the questionnaire, where in both cases more than 80% of the respondents agree that cruise control systems can be dangerous if left unsupervised. However, to ensure fail-proof safe use of this system, a few guidelines or rules can be implemented by drivers and manufacturers regarding this mechanism. Since safety is of utmost importance, there are several technologies in place that can ensure a safe in-vehicle technology system.[7] Multicoloured emergency lights can alert the drivers whether the car is in adaptive cruise control more; and furthermore, it must alert them on the status. For example, a green light could indicate the smooth functioning of the system and the driver may not need to intervene, but must still maintain full attention. An orange light could indicate the need for intervention either in terms of change of direction, speed or deceleration. When the distance between the vehicle and a preceding vehicle or hazardous object falls below the threshold deemed to be safe, an alerting red light could flash, at which point the driver would have to resume full control of the car in t-5 to 10 seconds, during which emergency brakes will be attempted to exert their function. In this way, high speed accidents on highways can be reduced, similar to how autopilot systems in airborne vehicles function. Also, short but mandatory training courses could be a requirement for



drivers intending to operate a car with adaptive cruise control, and a licence could be required for doing so. Drivers can avoid using this system during high-risk legs of a journey, for example at intersections, highway exits or areas with heavy traffic. To this end, Tesla models which incorporate Tesla Autopilot use highly advanced RADAR systems and multiple cameras to ensure complete safety of passengers. [6]. Its Collision Avoidance Assist systems also work towards a safer journey by alerting the drivers if there are any inbound collisions from any directions. However, this model is extremely expensive and more work will have to be done to manufacture this safety equipment on a cheaper scale to make safe and accident-free travel accessible to one and all.

### CONCLUSION

There is still a long way to go before road-travel accidents can fully be eradicated from being. Using the tools of technology, specifically Cruise Control in this context, it is possible that with more advancement high-speed travel can become an accessible commodity for the general public, and the staggering numbers of roadway accidents can be minimised. However, the technological future is bright and there is hope for this goal to become a reality in the coming decades.

### Acknowledgements

I would like to extend my thanks to the faculty in my college, Ms Shanta Chowdhary and Ms Varsha Kusnur for their guidance in this research paper.

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## DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES

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### Abstract

The modern world has embraced globalization, access to goods and services and low barriers to entry which has resulted in high competition in global markets. This, accompanied by improvements in infrastructure, communication and technology and large funding of start-ups and enterprises has led to a thriving industry of digital marketing, one which is used extensively by all businesses, regardless of size, budget and organization structure. The primary objective of the research is to identify the role of digital marketing in fulfilling the objectives of enterprises in small and large scale industries throughout the world (with special emphasis on India), analysing the differences in the methods of marketing used by industries depending on their size, scale, sector and position in the economy as well as identifying and exploring the potential of digital marketing on a microeconomic (firms and their profits) level as well as exploiting its potential on a macroeconomic level. The contents of this paper will also help understand the importance of digital marketing and analyse its impact on small and large scale firms and industries.

**Keywords** – *Digital marketing, economic transactions, profit, expansion, cost effective reach, brand value, targeted marketing*

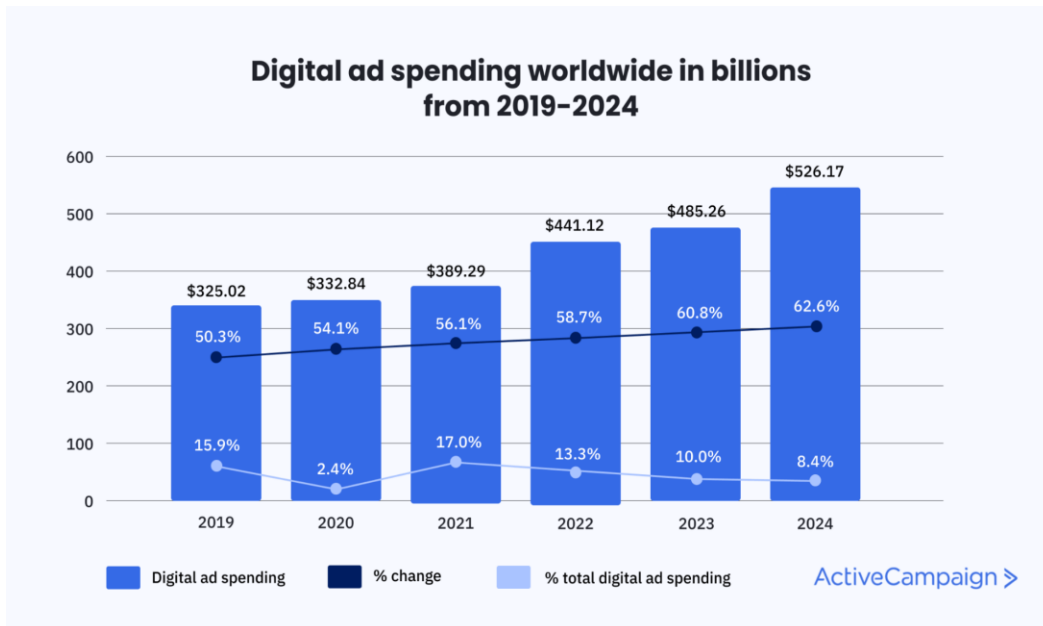
### Introduction

Marketing is the promotion of goods and services to increase demand leading to higher sales, revenue and profits. It means to identify and satisfy customer's needs profitably as well as promote the brand through various channels to reach and communicate effectively with customers. Digital marketing is the promotion of brands done through digital platforms, communication and technology, with the use of electronic mediums and the internet. Enterprises, both small and big may use a wide variety of methods to maintain an omnichannel presence digitally.

### Theory

#### Potential of digital marketing

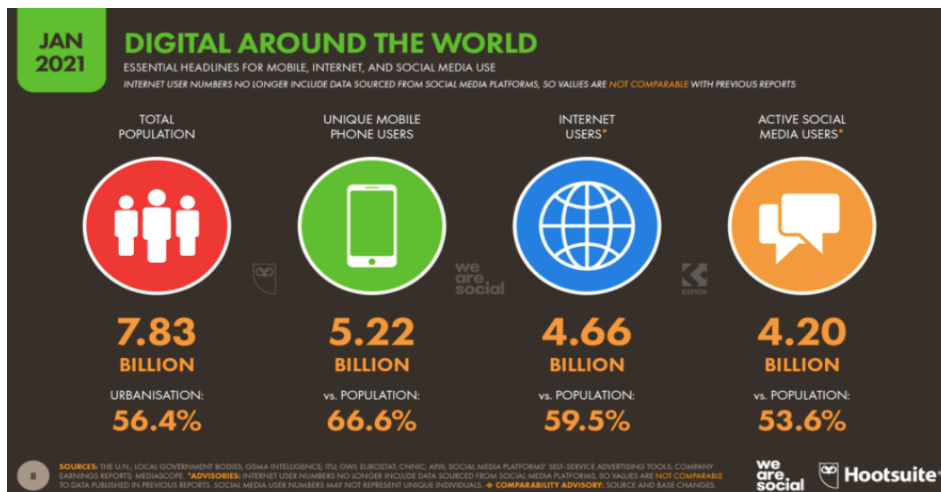
Over 50% of the world's population owns mobile phones, has adequate internet access and plays an active role on social media. Such an enormous audience provides companies, both small and large scale an opportunity to capitalize on an easily accessible customer base to boost sales and revenue significantly. A popular saying goes by – where there is attention, there is money. That, added to the fact that digital marketing is very cost effective, interactive and customized makes it an obvious choice for enterprises around the globe to engage in digital promotions. This has caused a spike in digital ad spend, which can be shown by the graph below.



The average growth in digital ad spend over the last 4 years is about 12%, a healthy increase that signifies that digital marketing is here to stay and as firms are receiving exposure and knowledge to the promotion techniques of the 21<sup>st</sup> century, they are diving in to secure their spot.

The average screen time for a person worldwide is 6 hours and 57 minutes, or about 7 hours. Think about it. An average person from the world, who is most probably living a life of poverty, has inadequate access to sufficient nutrition, clothing or even shelter is spending a third of their day on the screen. This is the 21<sup>st</sup> century! Accessibility, affordability, innovation and infrastructure combined with technological globalization has ensured that almost each person in the world has access to a gadget and the internet. Rich or poor, regardless of religion or culture, 67% of the world shares one common feature – they own a mobile phone. Everyone is on the internet!

The following image can summarize this information:-







This is exploited by countless enterprises, throughout the world that capitalize on social media and content marketing to maintain an omnichannel presence and encircle customers with goods and services, to create a brand recall value and generate sales. As a result, in the coming years more than 80% of all ad spend will be digital.

### Why are firms switching to digital marketing?

The first few pages emphasized on the potential of digital marketing, how its been dominating the globe and statistics that prove that enterprises have been switching their preference from traditional to digital promotions. In addition to the fact that all attention is digital, there are other factors too that lead to a popular choice of digital marketing for small and big enterprises, such as:-

1. **It is cost effective** – Several social media sites , blogging mediums and the internet in general are free of cost for firms to conduct organic marketing. Additionally, paid ads on social media and the internet are more cost effective than printing ads in newspapers and magazines since the cost of printing, delivery and sales is eliminated. This is great for small scale industries such as paper bags , restaurants, decorations, stationary and bakeries that are new to the market or have insufficient amounts to invest at the beginning.
2. **It is entertaining and engaging** – Content marketing allows customers to gain valuable insights, knowledge and content written by the business before they purchase the advertised product, which helps build trust and customer satisfaction. It is also engaging since customers can give feedback through surveys, questionnaires and comments and can react to pieces of content published by brands. They could also write emails for feedback.
3. **Targeted reach-** – It enables enterprises to pursue a very niche or targeted market at a low cost without sending advertisements to a larger segment of people, which saves money and allows the right people to receive the right promotions. It allows targeting based on location, age , gender and interests. This makes it cheap and effective for local firms such as restaurants, cafes, beauty parlours and shops.

### Vol. No Issue No, Date of publishing

4. **Global reach** – Brands that desire to expand globally, attract a large customer audience or sell online courses or digital products/services are no longer restricted to a local audience and can attract customers globally at a low cost. Online stores and e commerce websites too can sell their goods to a global audience.
5. **Analytics** – Paid social media campaigns can generate analytics which help enterprises analyse what kind of people interacted or ignored their advertisements. They can also track where most of their customers are coming from, and can spend more money on those platforms in the future. This was impossible through traditional marketing, since firms could never anticipate or determine whether their clients came through billboards, flyers or newspaper ads, and could not compare which type of marketing was working best. This is especially helpful for small firms, since they know what works for them and what does not and can hence spend money accordingly.



### Methods of digital marketing

The average attention span of a human being has shortened to a miniscule 8 seconds. This is a reduction of 50% over the last 10 years. As a result, small and large scale businesses are bending towards the production of engaging videos and infographics with creative concepts to capture the attention of customers, rather than displaying monotonous ads or focussing on writing.

The following are the major types of digital marketing:-

**Social media marketing** – It is the use of social media platforms such as Instagram, Facebook, YouTube, Twitter, etc to promote products or services. This usually refers to product promotions done organically, through posting content in the form of pictures, videos or reels to deliver entertainment, inform customers about products and services or to keep them updated on schemes, offers or ventures undertaken by the company. It does not involve paid advertisements or outreach.

**Paid social media** – This refers to enterprises capitalizing upon the opportunity to display their goods & services to a well defined audience targeted regionally or on the basis of gender, location, age or interests. As mentioned, its used primarily by small scale firms that have regional constraints and wish to attract customers from a particular area. Along with being comparatively cost effective to traditional methods, it also produces analytical reports to help firms assess their success and sources of traffic and sales. However, it requires a lot of expertise to conduct effectively.

**Influencer marketing** – This is an extended method of social media marketing, where firms partner with influencers to promote their product, leading to a higher reach and more brand value and trust. New and small firms cannot afford this type of promotion on a regular basis. However, large companies that require brand value and trust to achieve massive scales often partner up with such content creators.

**Search Engine Optimisation** – SEO is the process of improving the quality and credibility of one's content and website to gain organic traffic. When done right, it leads to a website ranking in the top few when a search is done by a customer. Searchers usually click on the first few links they find on the internet when they search for a particular term. Thus, having an article on the top aids significantly to increase traffic and sales for enterprises. This is used by both, small and large scale firms but requires exceptionally great content, expertise and ability to outperform other sites and pieces of content that can potentially rank higher (since the space is highly competitive).

**Pay per Click** – PPC is when an advertiser pays to rank a website high on search engines, temporarily or place ads. The firm pays the advertiser per click received on the advertisement or website. Its inorganic and can potentially lead to high traffic when done right. However, it is highly costly and doesn't ensure that those who click will purchase goods and services, leading to a waste of money. Digital marketing agencies might also send bots or fake accounts to click on the website to achieve the promised results, which will drain the firm from cash but will not lead to any quality results. Its high cost makes it a suitable choice for large businesses that are well scaled or have appropriate funding or budgets.



**Email marketing** – This involves building a list of targeted customers and sending out emails to promote goods and services to them. It is usually done in bulk using software that personalises the emails and makes it easy to gather analytics about the percentage of emails opened, read, clicked, etc. Although it is inexpensive, customers may ignore several emails and unsubscribe quickly. Earlier, it was used by large businesses to promote their goods and services. However, now a days even small firms and small scale industries are leveraging email marketing to communicate with customers, keep them entertained, gain feedback on products, conduct market research as well as keep them updated on offers.

**Affiliate marketing** – This is an old one. It's the classic way of sales that has existed always. Professional marketers, sometimes customers and employees and part time workers promote goods and services of a particular company to their friends, family or any type of audience that they can capitalize on to make a commission per sale made. It is used mainly by big businesses like amazon, but small businesses too offer such programs to boost sales and to make their brand well known.

### Digital marketing and small scale firms & industries

#### Why is digital marketing important for small firms?

1. **It helps boost sales** – Small scale industries and firms that are new to the market need a minimum number of sales to survive and make the necessary profits required to stay in the market. Additionally, small scale firms also need sales to pay good salaries/wages to employees and keep them well motivated. Digital marketing helps increase sales.
2. **It helps raise awareness on the firm's products and recall value** – Small firms and firms in small scale industries lack a great deal of attention and awareness. Social media and other forms of digital marketing help build the initial awareness required to create a brand or make profits. A higher brand recall value created through maintaining an omnichannel presence digitally by small firms will also increase customer satisfaction and will enable them to charge high prices.

#### **Vol. No Issue No, Date of publishing**

3. **It helps increase customer satisfaction** – Content marketing carried out by small firms helps better the relationship between firms and customers. Actively engaging in customer feedback through surveys, interviews, comments and questionnaires also allows firms to keep their product up to date and increases customer satisfaction.

#### **Why do small scale industries use digital marketing?**

Traditional marketing can yield effective results only when the audience to which the promotion is sent to is large, in which enterprises exploit selling economies of scale to secure large spots (full page ads) in famous magazines or newspapers or huge banners at the centre of the city to drive large traffic. However, small scale industries do not have the budget required to conduct mass marketing through traditional methods and thus cannot exploit these economies of scale. Additionally, their audience is very niche or locally restricted, such as beauty parlours, salons, pickles or toys which does not allow them to present their product to the whole market. Thus, digital marketing allows them to market in small volumes at low costs and with a targeted approach.

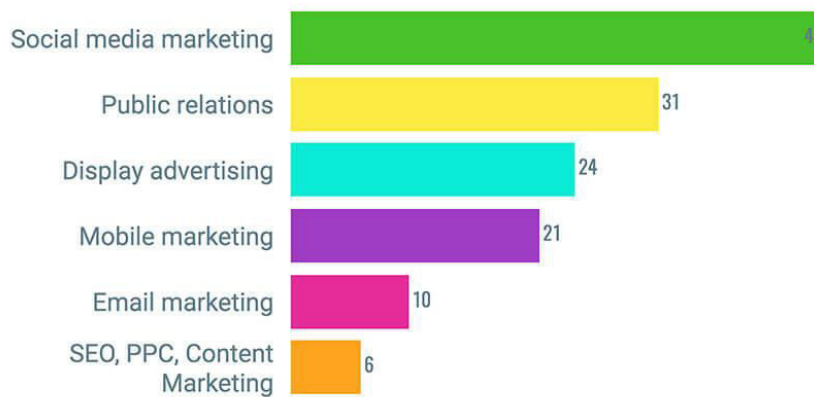


A small cafe in south Delhi may be constrained by locality and may only wish to target people living within a few miles radius of the restaurant. In such a case, printing an ad in the local newspaper will waste lot of money, again will waste even more money. Rather it can use Facebook and Instagram to target only people in south Delhi, with a fraction of the cost of a newspaper ad. Small businesses are also interested in increasing awareness which can be done for free through social media, SEO and content marketing.

### What type of digital marketing do small scale firms engage in?

They usually focus on social media. The following poster summarises it.

Digital marketing spend for small businesses (%)



### Experimental

A survey was taken personally from several small firm owners, and information regarding the types of marketing conducted by firms has been taken from the internet. The following are the findings:-

### Results

- Almost all small businesses invest in social media marketing to reach customers.
- Nearly 54% of small businesses use email marketing to strengthen personal connections with their customers.
- Small businesses are increasing investment in website marketing
- In 2022, small firms have switched to video marketing to engage and captivate consumers as a result of a small attention span.
- Firms are increasingly pressurizing their own employees to carry out affiliate marketing for more sales.
- More than 75% of firms are confident about the potential of digital marketing and believe their efforts and investment have effectively led to good results
- The dominant goals for digital marketing set by firms are to generate leads, convert those leads, attract traffic on their website, increase brand loyalty and raise revenue.

I have also interviewed a catering, clothing and small scale furniture retail store. Social media and SEO has had a tremendous impact on the sales of the three firms. Each one of the firms



recounts sales rising by 20%- 50% after using social media and other forms of digital marketing.

### Digital marketing for large firms and large scale industries

#### Why is it important?

1. **It helps raise revenue-** Large scale firms and industries need to raise a significant amount of revenue to cover fixed costs and re invest into the company, as well as an incentive for the work and to pay shareholders, investors or financial institutions. Digital marketing helps increase sales to meet these targets.
2. **It helps boost brand value-** Large scale firms such as paper, cement and automobiles need a good brand value so that customers buy goods and services from them and trust them. Brand value is also required for expansion, to open new outlets, factories or franchisees. Large firms use influencer marketing, advertisements, collaborations and sponsorships to build their brand recall value. For example, TATA has sponsored the Indian Premiere League to increase its recall and brand value.
3. **It aids in the process of expansion-** Large scale industries benefit extensively from expansion. Digital marketing, both B2B (Business to business) and consumer oriented marketing will help boost sales to such an extent that it will become viable for companies to expand and exploit economies of scale to increase profitability. A perfect example would be Tesla. This car company was very successful in digital marketing, which enabled it to expand and increase its production volume to such an extent that it can source all car components at dirt cheap prices due to the volume of its purchase
4. **It helps create a sustainable corporate image-** Public relations and corporate image is very helpful to a company. Digital marketing allows companies to tell the world about ventures and steps undertaken to ensure that their business is sustainable, environmentally friendly and/or is beneficial to the community. Tesla has been successful in delivering the vision of environmentally friendly transportation to its customers through effective digital marketing, thus boosting sales and creating a better brand perception and corporate image.

Large firms are usually very popular and already have a good amount of awareness. Unlike small firms, their primary target is not to make consumers more aware of their products. It is to convince customers, win their trust and surround them with goods and services to make them act in a way as to purchasing their products. Everybody knows that coke exists. Yet, this large scale FMGC company spends billions into marketing, not so that more people get to know about the company, but simply so that we think about it more frequently and associate the brand to be cool.

When you think of the word 'TATA', 'Reliance', 'Apple' or 'MICROSOFT', what happens? You can immediately tell what the brand is all about. This is a result of decades worth of time and billions of dollars spent towards marketing, specially digital marketing to create a brand image.

#### What type of digital marketing do large firms engage in?

Firms in large scale industries usually spend significantly higher amounts on content marketing as well as discounts and offers. Throughout all large scale industries, the FMGC industry spends the most on digital marketing, around 34%. This is because the FMGC market is highly competitive and associated significantly with brand value.



This also tells us that the higher the competition in the market, the larger the spend on digital marketing for that particular industry.

Take red bull for example. This energy drink company had a product that was no good. It didn't have good taste and it was not healthy either. Not to mention that it was priced out of the market! However, this company managed to sell billions of cans throughout the world every year. This is because of its phenomenal marketing strategy. It sponsors sports teams, influencers and partners with adventurous brands such as Go pro (strategic partnership since 2016) and also has a racing team. This projects red bull as a sporty, energetic brand which attracts worldwide customers and leads to unbelievable sales. Red bull is also a genius in content marketing. In 2012, red bull began an amazing campaign where they sponsored the jump of a man from the stratosphere and filmed it. Not only did it break a world record for highest jump, but also became the most viewed live stream ever at 8 million. The entire project cost \$65 million, but the exposure gained through it is said to be worth over \$1 billion, an amazing return on capital. In the following 6 months, there was a 7% rise in red bull sales accounting for an increase in revenue by \$1.3 billion.

Another example of this would be Ford. In 2009, when social media was starting to revolutionize the marketing space, Ford handpicked 100 influencers and gave them a car for 6 months each. All they had to do was make videos and tell the world about their experience. Due to this, Ford got a visibility of 6.2 million YouTube views and 40 million twitter impressions. And the result? Ford received 50,000 new customers, 6000 of whom pre ordered the Ford fiesta. This is the power of social media marketing for large scale industries such as automobiles!

### **Potential of Digital Marketing for the economy**

As we have seen, digital marketing can prove extremely useful to small and large scale industries to boost sales, revenue and profits. This lays the foundation for expansion and creates employment in an economy.

Digital marketing helps increase the number of economic transactions and trades being carried out, enabling more production and consumption of goods and services as well as higher incomes and Gross Domestic Product. It also has a great potential for employment. It increases the sales of firms, thus raising profits, salaries, and overall economic growth.

Digital marketing agencies and companies are always for the lookout for new recruits. Currently, there are about 860,000 roles open for digital marketing specialists, waiting to be filled out. Additionally, another 8 lakh new jobs have been created in the digital marketing field. As the world is moving towards automation and AI is replacing several workers throughout different industries, digital marketing offers a unique, skilled position which is safe from the threats of automation and can potentially provide employment in the future.

A well known fact in modern economics which forms the basis of the ideology of socialism is that a large number of small enterprises, when grown and worked effectively can provide employment to a vast majority of the population. Digital marketing plays a vital role in encouraging the creation and success of small enterprises, enabling them to serve and capture a target market and profitably sell goods and services to raise funds and expand.

By allowing large industries to have a national and a global reach, as well as boost sales, digital marketing helps establish and grow vital industries that add value to an economy. Apart from firms, digital marketing can also be used for marketing large scale industries upon which a country relies, such as tourism for India or Sri Lanka, thus boosting the economy and exports. It can also be used by the government to fulfil several purposes such as raising funds or donations to grow the economy or combat a crisis.



Small scale charity organizations might use digital marketing to increase awareness for their cause and raise donations to combat small issues in society. Large scale NGOs might raise massive funds to end major problems in society such as poverty, hunger, water access or climate change. They may use content marketing to light a fire and social media to add gasoline to it, and might also use affiliate marketing to expand their sources of finance.

Thus, digital marketing is not only essential for individual firms and companies but also to promote large scale industries upon which a country may rely and to boost employment and charitable donations for the benefit of society.

### Conclusion

Enterprises across the globe are making a critical shift towards digital marketing. Content marketing is the gem of the 21<sup>st</sup> century, consumers are consuming and appreciating valuable content and firms are rushing to produce it for sales. Small enterprises leverage social media extensively for its cost effectiveness and specialized targeting ability, whereas large companies are focussed on building an established brand and recall value to boost credibility and sales. Small enterprises primarily focus on using digital marketing for revenue and awareness, whereas large firms wish to expand and create a sustainable corporate image as well. Digital marketing also has significant potential to fuel economic growth and provide irreplaceable employment to millions of people, which must be explored by governments and firms. It can also help raise funds for large and small scale causes and charity events.

### Acknowledgements

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### DIGITAL MARKETING - AN AID TO BUSINESS' ADVANCEMENT

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#### Abstract

The research paper discusses the impact of various digital marketing strategies on teen-product industries, both large scale and small scale. The paper delves into the influence of digital platforms to boost small scales to evolve into a well-established brand. The paper consists of various experiments to strongly support the research and the novelty of the paper, which introduces a new e-marketing strategy. These methods also equip small scales to grow into a well-founded brand.

**Keywords:** e-marketing, brand and strategies

#### INTRODUCTION

Digital marketing consists of various techniques that help advertise the product in the market (techniques mentioned in the DISCUSSION section). As per research, teen-product industry is one of the industries that gains a lot of benefits from such different methods. Teen-product industries can easily reach their target audience as teenagers are mainly active or impacted by social media, influencers and actors, and messages/emails. The teen-product industry is a widespread industry such as food, make-up, clothing, and games. The novelty of the paper is a new strategy that is shown via advertisements: Comparative display which includes comparison/ benefits of the products compared to other products of the same category in the market. This can be displayed in a graphical or elemental method wherein each aspect of the product is compared.

#### Theory

The paper focuses mainly on two categories of the teen-product industry –

- Cosmetics/Make-up products

Large Scale Industry: L'Oréal - Founded in 1909, this company has revenue of 3228 cr EUR (2021). Moreover, as per research the company majorly propagates their products on digital platforms. Small Scale Industry: Cuffs n Lashes - Founded by Nidhi Katiyar and her brother Ankit Katiyar, it has been 5 years that the brand has been established. C n L is a growing makeup brand with over more than 50 products.

- Food

Large Scale Industry: California Pizza Kitchen– With a revenue of \$1 billion, the restaurant chain has over 250 locations across the globe. The restaurant was started in 1985 by attorneys Rick Rosenfield and Larry Flax in Beverly Hills, California, United States.

Small Scale Industry: 3 Barmen - All-day restaurant and cafe with three different sections each providing a different ambiance. The business started on 31st December





2020 with the idea and investment of three brothers - Rohan Salvi, Swapnil Salvi, and Aditya Salvi

### Experimental

The conduction of experiments was done to support the research and to help reach the novelty of the paper. Preliminary discussions were held with the company owners to help analyze how digital marketing has helped their establishment to grow and they have consented to a questionnaire which is available in the below link.

[https://forms.zohopublic.in/misa/form/ReunionForm/formperma/ba4XqAYmNF8MAGHnX12CfM7NG8FSdNKeR\\_NAr6dVoEo](https://forms.zohopublic.in/misa/form/ReunionForm/formperma/ba4XqAYmNF8MAGHnX12CfM7NG8FSdNKeR_NAr6dVoEo)  
 and <https://forms.zohopublic.in/misa/form/Form2/formperma/ok5J3WL4cpp7n8wl8YB80ojaJTt6Y54MkIYbCouBCSM>.

The survey was also conducted to help discover a new and more effective digital marketing strategy. Below is the survey link.

<https://forms.gle/mxyGaVKuPvj7chYC9> .

### RESULT

Business owners have shown a positive response that e-marketing strategies have helped their business grow; enabling them to compete with well-established brands and opening a new window for them in the market. Majority teenagers have selected the method of comparative display in the online survey conducted.



Fig .1 Various digital marketing methods

Name	Rohan Salvi	Ankit katiyar
The business you own	Food and Drinks	Cuffsnlashes
Do you think e-marketing methods have helped your business grow?	Social Media Marketing platform, Influencer Marketing, Search Engine Optimization (has collaborated with other websites so that they recommend your business)	Social Media Marketing platform, Influencer Marketing, Email Marketing, Content Marketing (distribution of newsletters/blogs/videos/ posts to current and potential customers), Search Engine Optimization (has collaborated with other websites so that they recommend your business), Pay per click



Do you think teenagers can easily attract/ be impacted to your business by digital marketing methods?	Yes, but since we do not cater to teenagers because of govt restrictions - no comments.	Yes
With how many influencers/ actors have you collaborated with to help your business grow	20-25	1000+
On a scale, how much has digital marketing helped you? (rating upon 5 stars)	★ ★ ★ ☆ ☆	★ ★ ★ ★ ★
With the help of digital marketing, how much has your sales grown? (5 ranges of percentage given)	21% to 40%	21% to 40%
Do you think digital marketing is cost-effective?	Yes	Yes

### CONCLUSION

Importantly, digital marketing not only serves businesses' scalable growth that they aspire but also provides opportunities for start-ups to match strengths with the business giants. Being profitable for any given businesses, online marketing caters to an unexpectedly huge audience in a short period of time. Teenagers, being socially active, make up as major patrons for business' turnover. With the research and experiment carried out, it can be expected that business owners capture their audience via comparative display advertisement, nevertheless, significant attention has to be paid that the other brands are not offended by the following method.

### Acknowledgment

I would like to express my heartfelt gratitude to most importantly my parents and teachers: Mr. Pranay Sawant, Mr. Sohan Dhuria, Ms. Roshni Choramble, and Ms. Cynthia D'souza for their unwavering support and guidance. I would also like to thank Mr. Amit Raut for his assistance with the project. Special thanks to entrepreneur Mr. Ankit Katiyar and Mr. Rohan Salvi for their cooperation. Moreover, thanks to MISA's technical team.



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### IMPROVISATION IN UNDERWATER COMMUNICATION FOR DISASTER MANAGEMENT

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#### Abstract

Underwater communication is a technique of sending and receiving messages below water. There are several ways of employing such communication but the most common is by using hydrophones. Underwater communication is difficult due to factors such as multi-path propagation, time variations of the channel, small available bandwidth and strong signal attenuation, especially over long ranges. Compared to terrestrial communication, underwater communication has low data rates because it uses acoustic waves instead of electromagnetic waves. Underwater communications play an important role in marine activities such as environmental monitoring, underwater exploration, and scientific data collection.

**Keywords:** *Underwater communication, hydrophones, acoustic waves, environmental monitoring, underwater exploration.*

#### INTRODUCTION

At the beginning of the 20th century some ships communicated by underwater bells as well as using the system for navigation. Submarine signals were at the time competitive with the primitive Maritime radio navigation service. The later Fessenden oscillator allowed communication with submarines. Despite the seminal developments, underwater wireless sensor networks (UWSNs) have the potential to empower humanitarian applications on the oceans. UWSNs have the ability to sense locations in the underwater environment where human beings cannot see, process data locally, and transmit them via underwater wireless communication. UWSNs can benefit humanitarian needs, such as mitigate disasters, relief in global warming, and provide access to scientific data.

#### THEORY

The growing need for underwater observation and subsea monitoring systems has stimulated considerable interest in advancing the enabling technologies of underwater wireless communication and underwater sensor networks. This communication technology is expected to play an important role in investigating climate change, in monitoring biological, biogeochemical, evolutionary, and ecological changes in the sea, ocean, and lake environments, and in helping to control and maintain oil production facilities and harbors using unmanned underwater vehicles (UUVs), submarines, ships, buoys, and divers. However, the present technology of underwater acoustic communication cannot provide the high data rate required to investigate and monitor these environments and facilities. Optical wireless communication has been proposed as the best alternative to meet this challenge.



### Experimental

Various types of wireless networks have emerged like Ad hoc networks have emerged as one of the reliable communication technology, which can deal with the situations during any disaster. Key aspect used is communication between people suffering and rescue team members to save lives. In this case, situations of conditions like flood or tsunami etc. have been considered. In underwater situations, sensor nodes [7, 8, 9, 10] are deployed, these sensor nodes have a lifetime suitable for communication and are also able to charge using solar light or other mediums. Sensor nodes are stable deployed randomly. Sensor nodes are used to trace any signals, these signals can send to next level using mobile nodes. The mobile nodes can act as routers as well. These nodes take the data to gateway nodes and these nodes take data to the base station. Transmission speed is approx. 50 kilobits per second (kbps), packet size mostly is 1024 bytes. This data is handled using satellite communication by telecommunication agencies. Comparison based performance (CBR) is adopted as it is used for any type of data for which end-systems require a predictable response time and amount of bandwidth. Simulation has been done for assessing real-life situations. In case of disaster response, many models have been highlighted. Some most widely used are synthetic, map-based, and trace-based mobility models. The most used can be identified as synthetic mobility model. Their creation is mostly done using Generator, something like Bonn Motion . In this type of model, the case area, i.e. disaster area can be categorized into three parts. One will be designated as an incident site, the other two are casualty and transport. Communication methods built on physical communication infrastructure used to have several limitations. Wireless communication networks have limited range and signal strengths and energy also plays a crucial role in the overall working of the network as well as infrastructure. The ad hoc solution still has been considered as a major solution in rescue operations. It seems that in future whenever some undue disaster happens, the deployment of ad hoc networks [15, 16] can be a solution.

### RESULT

- It promotes the use of renewable resources.
- Helps to control the disaster management.
- Improves the communication by different wireless networks.

### DISCUSSION

This research paper presents a brief summary on underwater communication, how wireless networks can solve the problems regarding disaster management and also enhance underwater communication. The research paper also describes the experiments carried out by some wireless networks like Ad hoc and how it can be beneficial.

### CONCLUSION

An analysis has been done starting with the underwater problem of data depletion to general disastrous situations. A general solution has been proposed. This will take care of situations that come under the category of disaster and sudden loss of signal or communication. It has been observed in the study that proper antenna insertions are a vital matter. At times it actually can change the scenario a lot. It was observed that a gain in signal strength of more than 70% can be



achieved. This process can be adopted at a mass scale in case of disasters and lives can be saved. The result shows that the improvement is there for the simulation carried out with the scenario set for the test. The underwater communication can also be tried as well. The results were carried for the stability of the network and the energy used by the nodes. The energy used is not much even in the disastrous situation although the security aspects were not tested, although that may not be very important in the disaster situation. The most important is the connectivity to be established and it will perform well in the disaster. So, at last we can conclude that with experiments conducted, that can be implemented on large scale and should help the present as well as future generations.

### ACKNOWLEDGEMENTS

None

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### HOW DEPENDENT SHOULD ONE BE ON WEARABLE SENSORS FOR MONITORING OF THEIR HEALTHCARE

**Jai Mishra**

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#### **Abstract**

This paper was written to analyze the dependency of reliable sensors, both medical grade as well as commercially produced kinds. Various types of sensors were analyzed based on their working and other factors of 'dependency' were also taken into account. This paper further explores what we can conclude from a case study and evaluates the usage of wearable sensors and their future.

**Keywords:** Monitoring, Reliability of Technology, Accelerometer, Photoplethysmography, Electrodermal, Temperature

#### **INTRODUCTION**

Wearable sensors are body-monitoring sensors that are implanted in wearable objects like rings, watches, or directly into the body. As a result, they provide continuous real-time updates on body vitals like oxygen level, heart rate, blood pressure, etc. directly to the relevant parties for healthcare or research purposes. They have also found use in tracking physical activity, this concept being the base of products of major companies like the 'Apple watch' by Apple. These sensors not only provide invaluable information to medical bodies, but they have also been a vastly successful idea commercially. The market for wearable sensors has been amplifying expeditiously and is predicted to have nearly a 20% growth in the next 5 years. However, with such exponential growth, any product or idea related to medical care is bound to come under scrutiny for its reliability. After all, even a small percentage of inaccuracy here is equivalent to the safety of millions. This report aims to understand these sensors fully and make an educated statement on whether wearable sensors are truly reliable.

#### **Theory**

The technology used to detect vital levels and body movements is the main topic that comes under focus here. This report shall go over the most popular technologies utilized in these sensors and their reliability. In cases where the medical data is to be sent to a medical body, while the transfer of data is also a valid concern, more often than not in today's world, all of the data is transferred efficiently through a third-party warehouse. However, problems might arise when the wearer travels to a location far (a different country maybe) from the receiving medical body. The data might not communicate, or might do so partially, which can have grave consequences.

#### **Types of sensors:**

**Accelerometer:** An accelerometer is a sensor that mainly tracks physical activity. It detects gravitational and linear movements and records velocities. These are used in nearly every smartphone, smartwatch, and medical tracker. Accelerometer uses a crystal that gets stressed



when subjected to force due to motion. A voltage is produced and the reading is formed. This device uses a physical property of a substance to give its reading and hence is accurate for the most part. A federally funded study by John Hopkin Medicine researchers showed that accelerometer sensors are more reliable when it comes to the measurement of physical activity than most other methods that physicians use. However, while this device shows an accurate reading according to the motion it's put through, it does not mean that the reading is true for the wearer, especially the ones using smartphones and smartwatches. This is because this sensor is only built to judge the traditional motion of walking and running, and it even counts actions like moving one's arm around in the air. Hence, outputs like steps and calories burnt displayed in these devices might be heavily skewed. Gyroscopes are similar to accelerometers except they record angular motion rather than linear. They are reliable for the most part.

**Photoplethysmography sensors:** This is a sensor that records cardiac function by inspecting the flow of blood. It can give results like heart rate and blood oxygen level. The sensor involves projecting light onto the skin and recording the blood flow using this light. There are a number of factors that might interfere with the sensor and give an incorrect reading, like skin colour, amount of hair on the skin, how tightly the wearer has put the sensor on (it is usually worn on wrists), etc. Since light is the weapon of choice for this sensor, it is a given that external light, if it happens to shine upon the area under detection by the sensor, can give an inaccurate reading. This is especially a problem for non-medical sensors like on FitBits because the wrist can be easily exposed to sunlight (or artificial light), rendering the device near useless at times and hence making it completely unreliable. However, medical photoplethysmography sensors are usually fitted with velcro around the wrist or finger which makes them much more reliable for tracking cardiac health.

**Temperature sensors-** Temperature is one of the most common body vitals one sees on fitness trackers as well as one of the most important ones for medical bodies for tracking physical health. It uses a special device called a thermistor which changes the current in a circuit if the temperature changes. Since this is one of the oldest and hence most researched on body vital, the sensors today are very accurate. The best quality ones give accuracy up to 0.09 degrees Celsius. Owing to the fact that there aren't many disrupting factors, the temperature sensors on commercial fitness trackers are fairly reliable as well.

**Electrodermal sensors-** These are a relatively new type of sensor that can measure stress levels indirectly by measuring one's sweat production since the fear levels are directly linked to the sympathetic nervous system. These sensors have been proven through various studies to be fairly accurate in their readings. It has also been used in the process of studying diseases such as autism spectrum disorder.

This was the individual analysis of the most popular sensors used commercially and medically. However, the reliability of sensors does not include only accurate readings and proper data transfer. Data theft is a major issue in today's world and protection of privacy is also a reliability factor to be considered. At the moment, data from wearable sensors is not valuable enough to be targeted by hackers. But as their usage rises and new features (and hence information) are introduced, the data might become subject to cybercriminals. This is also especially dangerous since today, most of this data is transferred via basic modes of transfer like Bluetooth or WiFi with little to no encryption. This data can also be sold to large companies once it becomes important enough.



### Experimental

A study on EMG and IMU sensors (physical activity monitors) of 8 healthy construction workers was done and results were analyzed. The aim of this experiment was to test the reliability of the sensors by checking whether the physical activity data and body level monitoring given as output by the sensors matched the reality. A Myo armband of roughly 100 grams of weight was used and the data was transferred through Bluetooth Low Energy wireless connection. If the user is stationary for more than 30s, the device would go into an idle state. The device was tested and the subjects were made to get familiar with it. A total of 7 experiments were conducted, all testing various aspects of the sensors.

### RESULT

The results given by the sensors were analyzed and cross-examined with conventional sensors. The results were plotted on tables.

Table 1. Comparison of EMG and IMU data quality of Myo armband and conventional sensors.

	Accelerometer (Units of g)				Gyroscope (rad/s)				EMG			
	Myo		Conv.		Myo		Conv.		Myo		Conv.	
	SD	SNR	SD	SNR	SD	SNR	SD	SNR	SD	SNR	SD	SNR
At-rest Activities	0.00	514.12	0.00	340.64	0.00	1.32	0.04	0.32	3.01	0.87	0.00	0.83
Screwing	0.02	80.42	0.03	35.30	0.31	0.52	0.62	0.43	4.39	0.78	0.02	0.67
Wrenching	0.03	37.10	0.04	25.88	0.39	0.66	0.40	0.71	5.64	0.70	0.02	0.67
Lifting	0.13	8.82	0.15	6.96	0.95	0.00	0.97	0.69	19.50	0.40	0.07	0.41
Carrying	0.06	16.07	0.07	15.35	0.45	1.22	0.50	1.16	11.35	0.70	0.01	0.86

Figure 1. Table comparing reading of EMG and IMU sensors with conventional sensors

### DISCUSSION

The study assessed the reliability and quality of the sensors. The general result was that the sensors were perfectly reliable and their data matched with the data measured through conventional means. It detected different intensities and weights as well and the point of wearing of the sensor was shown to have positional freedom as well. The sensors were deemed accurate and trustworthy for all fields and could even be used for generating data models.

### CONCLUSION

Wearable sensors are the future of healthcare monitoring. The convenience and precision they provide is of great benefit to the medical system, as it enables patients to continue on with their life as usual and thus frees up hospital beds, all while still being under the same monitoring. However, this is just regarding the sensors created for medical use with absolute precision. Commercially sold wearables yet have a long way to go before they can be called reliable. This paper is meant to highlight the issues that might possibly arise with an item as sensitive as this. To conclude, wearable sensors are dependable to a great extent if and only if they are crafted with great care and quality, and while the mass-produced ones are not up to the mark yet, they undoubtedly will be with the current trend of technology.



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### IMPLICATIONS OF EFFECTIVE LEADERSHIP TO ELEVATE ORGANIZATIONAL PERFORMANCE

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#### Abstract

The following research aims to discover the credibility of a powerful, influential leader. Firstly, it explores the various types of leadership styles and its implications on workforce morale along with determining an explicit cause-effect relationship between the effectiveness of the leadership style against the success of the organization vis a vis completion of the goal. It claims that an influential leadership promises a competitive environment and fosters employee motivation and performance. Due to this, it strongly endorses the effective implementation of leadership techniques to achieve their set goals and objectives.

**Keywords-** Influential, leadership styles, cause-effect, leader, goals.

#### INTRODUCTION

According to Livingston, leadership is described as a process of influencing a group of people to follow a common objective. This terminology is often acquainted with politics, business, sports and religion wherein emotional, authoritative or logical influence generally appeals to the audience. Moreover, Messik and Krammer (2004) argue that leadership is a quality not only as a result of characteristics, personality and traits but also due to situational instincts. However, the most fundamental impact of leadership is to inspire and persuade the employees that by adhering to the tasks or goals put forward by the leader, their personal objectives would be met and that, if the employees' personal gains are not met, their dedication towards the job would decline. Many organizations have perished in the past due to poor leadership. A major example was the Indian Info COMM giant, Reliance Communication (Rcom) who went on from becoming a major player in worldwide communication to a bankrupt, insolvent organization in merely 2 decades due to poor leadership. Thus, I hypothesise that leadership and performance are directly proportional.

The next aspect of the research aims to determine the most beneficial leadership style. However, the experiment below would only consider *Autocratic, Laissez Faire, Transactional and Transformational Leadership styles*. Autocratic (Authoritarian) leadership exemplifies the leader's control to the extent that he dictates procedures, sets goals and commands rules and regulations. An example Donald Trump, founder of the Trump Organization. Alternatively, Laissez Faire leadership is the other end of the spectrum of leadership as it promotes the absence of any authoritative figure and all decisions are taken mutually among the employees. Steve Jobs, founder and Ex- CEO of Apple, was a Laissez- Faire leader. Furthermore, Transactional Leadership involves giving employees rewards and Incentives upon task execution and focuses on evoking emotion and desire to unlock the potential of their employees and is already implemented by Bill Gates, former CEO of Microsoft. Lastly and arguably the most beneficial, most prevalent form of leadership is Transformational Leadership which is an amalgamation of inspiration and charisma that helps to build more leaders. These



leaders are optimistically backing their taskforce. A great example would be Jeff Bezos, the CEO of Amazon.

The final aspect of the research, in accordance to the X and Y theories put forward by Douglas McGregor, helps to determine whether a Trait, situational or Contingency approach are ideal for a business environment (the following will be explained in more detail in the next spread). It concludes stating the rudimentary roles of the leader i.e., to have a long vision, plan strategies objectively, communicate effectively with the workforce, inspire underperforming personnel, be perceptive to the reality, set necessary deadlines, save the organization from the numerous perils that are guaranteed to arrive and lastly, take quick, shrewd and vital decisions.

### THEORY

Douglas McGregor introduced two revolutionary theories 'X and Y' in 1960 to transform the traditional concepts of leadership. He divided his employees into two broad categories, X and Y based on their inherent characteristics and demeanour in the workplace. His shocking conclusions about 'X type of employees' are summarized below: -

- 1) The average human being dislikes work and will try to avoid it under major circumstances.
- 2) Due to this disinterest, the employee *will* have to be rewarded, motivated, coerced and even punished to improve efficiency. It agrees to the novel 'carrot and stick' objectives.
- 3) The average human hates responsibility, exertion and ambition as it only demands job security.

The assumptions of theory Y are relatively different from the hypotheses coined by theory X. The conclusions about 'Y type of employees' are summarized below.

- 1) These employees find their jobs relaxing and enjoyable so are dedicated towards their duties without external influence but due to self- motivation and control.
- 2) Employees learn to take responsibilities as they groom themselves in the environment. Taking control of the situation occurs naturally in them.
- 3) They possess advantageous skills and capabilities. Organizations fully utilizing and harnessing their potential benefit the most.

The above notions are widely contradicting. Theory X optimizes a 'pessimistic approach to employee demeanour' whereas Theory Y seeks to demonstrate the positive side. However, the approach(es) towards both these types of employees must be carefully assessed.

### TRAIT APPROACH

The trait approach is based upon the premise that 'leaders are born, not made.' According to *Carlyle's Theory*, some individuals inherit a pattern of behaviour that makes them suitable to handle leadership positions well. Furthermore, it claims that qualities such as longevity, extraversion and decision- making can't be imbibed by a person. Not only that, Responsible persons fit for managerial positions would lead their counterparts without any formal training or instruction on leadership. Countless businesses, for example, The Birla Group are smoothly functioning based upon this approach.



### SITUATIONAL APPROACH

Situational Leadership involves taking decisions according to the ebb and flow of the moment. The Leadership style may also change in this approach as it thrives upon the uncertainty of the circumstance. The primary factors that influence the change in decision coined by the *Hersey-Blancard model* are briefly mentioned below: -

- i. The specifics of the task- whether the task at hand is simple or complex
- ii. Relationship between the employees and the leader- Does the leader confer the power to command, punish or reward? If employees are intelligent, a more Laissez- faire approach is selected. If the leader is the most intelligent, an autocratic approach may be selected.
- iii. Maturity Level- Do the employees have the skills required for the task and are they willing to do the task

### CONTINGENCY APPROACH

This is a more 'mathematical' leadership approach coined by White-Hodgson following a sincere belief that no leadership style or approach is absolute. All decisions are required to be made on rudimentary elements like assessing the needs of the followers, stock of the situation etc. Taking the 'right' decision is more about keeping all organizational factors at check.

### METHODOLOGY

The below experiment was carried out through *the online platform* wherein a *Google Form* was filled by 40 individuals with different employment status (employed, self- employed or none of the above), age (15---→55<sup>+</sup>), gender and mindset. They were asked to fill a carefully prepared questionnaire consisting of 2 short answer questions followed by 7 multiple choice questions. A Dichotomous- scale approach was mainly followed. A pre-test on the experiment was also conducted to prove the validity of the instrument.

### TEST OF HYPOTHESES

H<sub>0</sub>. Leadership determines the impact of organizational performance

H<sub>1</sub>- The effectiveness of prominent leadership styles (Autocratic, Laissez- faire, Transactional and Transformational) to adjudge the most appropriate leadership style

H<sub>3</sub>- The most appropriate approach to leadership being Situational, Contingency or Trait theories.

### RESULTS

The google form was sent to 45 participants, out of which 88.89% of participants filled the form while the remaining 11.11% of candidates returned the questionnaire. The age distribution was sparse in 6 categories with major responses being in the 45-55 category (42%) indicating an experienced, mature audience. Furthermore, 52.5% of the audience was employed and another 17.5% were self- employed (total 70%) being in fine touch in various arrears and some, even having leadership roles, reducing the inaccuracy of the experiment.

R<sub>0</sub> According to the results, 100% of all participants believe that leadership and organizational performance are directly proportional, showing a strong positive co-relation.



R<sub>1</sub>A thumping majority of 57.5% of participants believe that Transformational Leadership is the most credible and appropriate for their work environments respectively as they believe that this style fosters leadership and inspiration.

R<sub>3</sub> 67.5% of the participants prefer the situational theory over the trait theory with 67.5% of them also siding with a contingency approach.

### INTERPRETATION AND DISCUSSION

Leadership, according to the views of all individuals would ensure organizational success as it would stimulate on- the job efficiency, dedication and perseverance among the employees. However, while further considering the results, certain interesting results about other leadership styles could be determined.

What type of a boss/leader would you like to work under?  
 40 responses

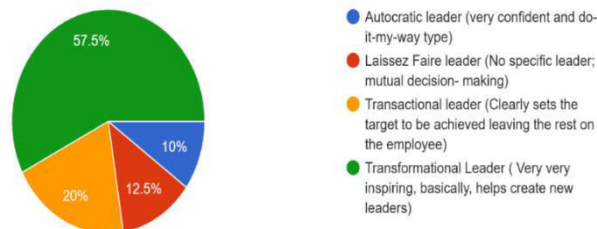


FIG 1.1

While the above pie- chart effectively showcases the highest probability of Transformational Leadership being determined, it notifies the resentment towards Autocracy (, stating that

- Employees need creativity and imagination
- Employees look towards inspirations and role models and wish to mould themselves accordingly.

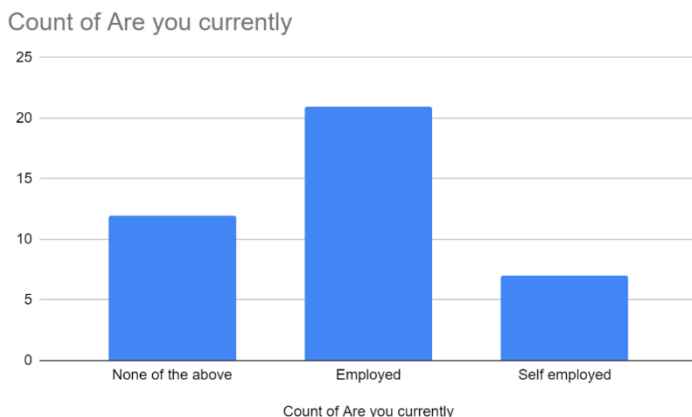


FIG. 1.2.

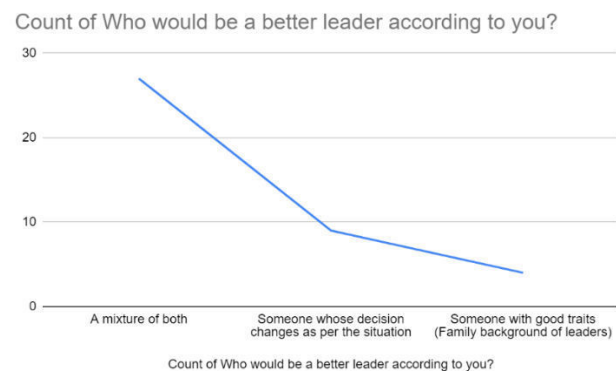


Fig 1.3.



**FIG 1.4.**

c	
Age	What type of a boss/leader would you like to work under
45-55	Transformational Leader ( Very very inspiring, basically, help
45-55	Transformational Leader ( Very very inspiring, basically, help
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45-55	Transformational Leader ( Very very inspiring, basically, help
45-55	Transformational Leader ( Very very inspiring, basically, help
45-55	Transactional leader (Clearly sets the target to be achieved I
45-55	Laissez Faire leader (No specific leader; mutual decision- m
45-55	Transformational Leader ( Very very inspiring, basically, help
45-55	Laissez Faire leader (No specific leader; mutual decision- m
45-55	Transformational Leader ( Very very inspiring, basically, help
45-55	Transformational Leader ( Very very inspiring, basically, help

Fig 1.3. discovers a trend. A vast majority of 81.25% of participants between the ages of 45-55 believe that Transformational Leadership is the most appropriate leadership style. The experience of individuals in this sector is noteworthy and improves the accuracy of the result. Fig 1.4. is the employment chart.

### CONCLUSION

The purpose of leadership in a business environment would ensure a dedicated, determined, inspired and a highly competitive taskforce which would indeed stimulate impeccable on- the-job- efficiency, discipline and operational expertise coupled by maintaining a healthy business culture in order to maximise revenues and portray a positive organizational image. Not only that, it would lead to coherence in the execution of policies and resolution of the employees’ problems, encouraging productivity and viable economic operations. However, to achieve this common vision of success, the personal characteristic of the leader is of utmost importance. Leaders can lie across numerous trophic levels in the business and it is the coordination and assimilation of individual ideas that truly skyrocket organizational profits. For the same purpose, Transformational leadership is deemed as most beneficial as it might possibly improve communication, create passion, improve effort and eventually lead to success. However, the leadership approach must be groomed as per the employee’s demeanour in relation to ‘X’ and ‘Y’ type of employees. While a trait approach is prevalent in the sector like the famed Birla Group in India, a contingency approach is the key. This leader would be leading the organization on a logical rationale than any genetic benefit. In conclusion, this Research Report advises all organizations to: -

- A. Employ a suitable Leader as there is a direct relation between leadership and organizational success.
- B. The leader should be skilled to ensure that his qualities are imbibed by his staff (Highly Transformational)
- C. Decisions can change as per circumstances. No decision is absolute and that, all are contingent.
- D. It is important to classify employees in terms of ‘X’ and ‘Y’ to fully optimize the contingency theory.



**ACKNOWLEDGEMNT-** The participants of my google form.

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## RELIABILITY OF WEARABLE SENSORS IN HEALTH CARE MONITORING

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### Abstract

Objective of the experiment was to test the reliability of wearables in healthcare. Also, to check if technological advancement has helped in the accuracy of these sensors in modern day wearables. After testing results showed inaccuracy in the sensors. Proving that sensors in modern day wearables are not as reliable as advertised by the companies.

**Keywords:-** accuracy, commercial wearable devices, Noise, Dizo, boAt, Crossbeats, Pebble, Tagg, Gionee

### Introduction

Recently there has been a rise in purchasing of wearable devices for health tracking especially for health tracking. Newer wearables have been known to make claims such as being extremely accurate and being able to detect diseases and health problems. The issue is when tested they were seen as not reliable in other papers, and I wanted to test that.

### Experimental

For the experiment I basically took a couple of smartwatches by popular market leaders such as Noise, Dizo, boAt, Crossbeats, Pebble, Tagg, Gionee. I strapped the smart watches onto two fruits an orange and a guava. For the testing of the heart rate monitor. I then turned on the heart rate checking program to check if a pulse was detected.

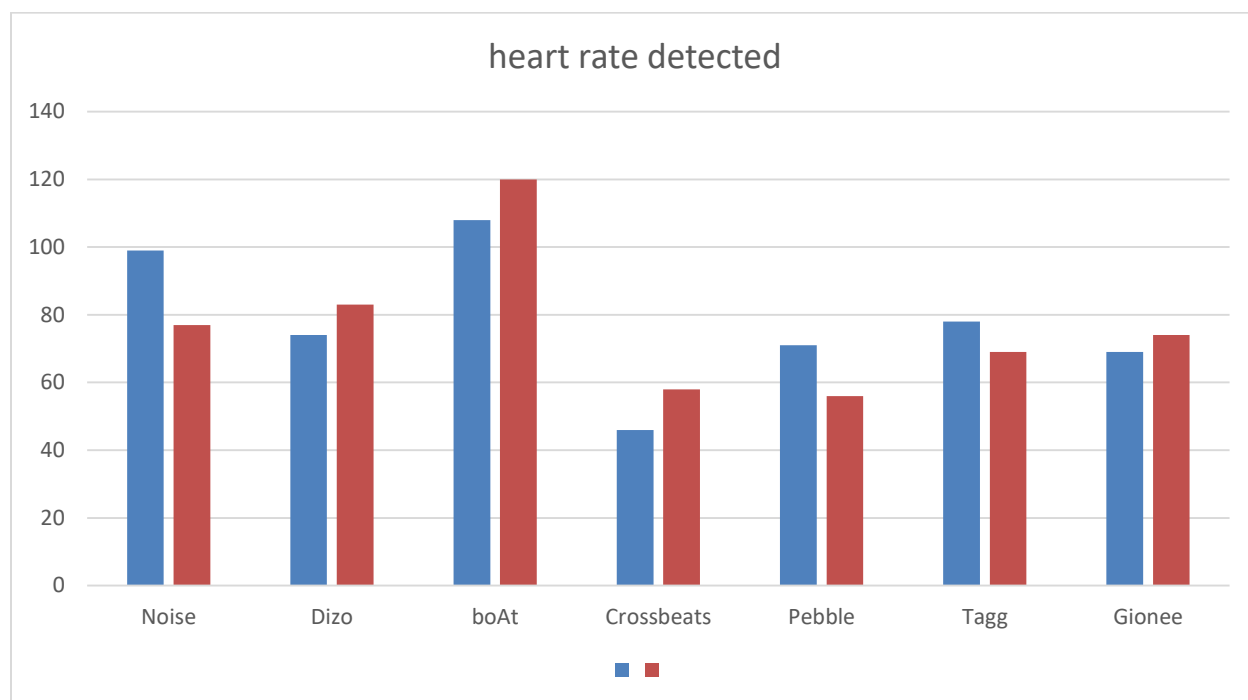
### Results

Since smartwatches and fitness bands measure heart rate by scanning blood flow near your wrist, by illuminating it with LEDs. The colour green is chosen, because it is absorbed well by our red blood, so optical sensors can gauge the flow of blood and heart beats more accurately. All the smart watches showed a pulse on both fruits as the light illuminated the water contents of the fruits and the optical sensors gauged that as blood flow. This goes ahead to show the inaccuracy and false claims made by companies as these popular and so called technologically advanced smartwatches couldn't differentiate between a fruit and a human. The same two fruits were used but it's also observed how all watches gave a different reading



### Discussion

Heart rate detected by each brand on the fruit in bpm		
	orange	guava
Noise	99	77
Dizo	74	83
boAt	108	120
Crossbeats	46	58
Pebble	71	56
Tagg	78	69
Gionee	69	74



### Conclusion

Commercial wearable devices are accurate for measuring steps and heart rate in laboratory-based settings, but this varies by the manufacturer and device type. Devices are constantly being upgraded and redesigned to new models, suggesting the need for more current reviews and research.

### Acknowledgements

Technoob's youtube channel, Arshad Ahmed



### PRECISE SURGICAL TREATMENTS ENSURED WITH DIGITAL TWIN MODELS

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#### Abstract

The goal of each medical practitioner is to enhance medicine and offer precise cures to the sick. Considering each individual patient's conditions and providing accurate treatments suited to them is now enabled by the expeditious increase in technology. Artificial intelligence and computational modelling have initiated the creation of digital twins of a patient's ill organs. Digital twins enable the studying and discovery of new knowledge, the formation and evaluation of new hypotheses, and are anticipated to play a vital role in the development of personalised therapeutic interventions in the long term. This paper highlights the advancement of digital twin technology and enhanced surgical curation.

**Keywords:** *enhance medicine, accurate treatments, creation of digital twins, discovery of new knowledge, development of personalized therapeutic interventions*

#### Introduction

A digital twin is a virtual duplicate or representation of a tangible object or process, although it is something more. It is a virtual model (statistics and as well as algorithms) with unique characteristics not offered by traditional models and simulations, one that adaptively couples the real and virtual worlds and utilises modern technologies such as smart sensor technology, data analytics, and artificial intelligence (AI) to detect and prevent system failures, improve system performance, and explore new opportunities. The ultimate purpose of digital twins is to model, evaluate, and improve a physical thing in virtual space repeatedly until that model matches predicted performance, at which time it is ready to be created or modified (if already created) in the actual world. [1]

Unlike physical products and processes in design and construction, one of the foundational element variables to be computationally replicated in the medical field human body itself—is significantly more complicated. Fortunately, with today's sophisticated scientific understanding and comprehensive simulation powers, it is possible to build digital twins for modelling many elements or functions of the human body, such as bio-physical systems or protein structures. This would allow researchers to analyse study questions more effectively such as drug interactions, therapy efficiency, treatment safety, and so on. Digital twin technology can potentially enable personalised medicine research by leveraging medical data of patient characteristics and patient-generated data. [2]



### Interview with Medical Practitioners

Upon taking an interview with 5 medical practitioners on whether they feel Digital Twin technology is the future of medicine and why, various possibilities were brought forward and analysed thoroughly. The interview questions include whether the experts know about the recent employment of digital twin technology in their fields of medicine, do they themselves use the computational simulation, their opinion on whether it they feel it is a beneficial innovation and lastly, their reasons for using or not using the technology.

### Result

As a result of the interview conducted on a highly brainstormed topic, 3 out of 5 healthcare experts suggest that the advanced technology of Digital Twin should be used to be advantageous to patients and strengthen the growth of precision medicine. William Blake quoted, "Hindsight is a wonderful thing, but foresight is better, when it comes to saving life, or some pain", therefore, for making sure that safety is the priority, the progressive invention of Digital Twins is a must in today's field of medicine.

### Discussion

The interviewees commented upon the various merits of this technology and some of the drawbacks and challenges faced by them while using Digital Twins. The most common advantage was the ability to provide 'Personalized Diagnosis'. Predictions on reactions of a patient to a particular drug or treatment, suitable method of surgery and management of surgical risks is now easier for the doctors all due to Digital Twins. Collection and usage of crucial data at an individual level which helps in tracking persistent conditions and providing accurate care to patient's needs. Moreover, 'Resource Optimization' has become unchallenging for hospital management staff. Leveraging chronicled and real-time information of hospital operations and encompassing environment (e.g., COVID-19 cases, car crashes, etc.) To make digital twins empowers clinic administration to distinguish bed deficiencies, optimize staff plans, and help work rooms. Such data increments the effectiveness of assets and optimized the hospitals and staff's execution, whereas diminishing costs. Digital twins also impart a secure condition to test the changes in framework execution (staff count, operation room openings, devices, and instrument management, etc.) Which permits actualizing data-driven strategic decisions in a complex and delicate environment.

A digital twin of a therapeutic device empowers engineers to test the characteristics or employments of a gadget, make modifications in plans or materials, and test the success or failure of the alterations in a virtual environment before fabricating. This altogether decreases the costs of founders and improves the execution and security of the ultimate item.

On the other hand, although the healthcare framework employments digital twins' increment, it is contended that it'll stay costly and not available for everybody. Digital twin innovation will end up an advantage saved for individuals with higher money-related capabilities, which would generate disparity within the healthcare framework. Furthermore, public interest in the new technology is also required to achieve a favourable outcome.

Either way, the need for promising results has risen hence this method is surely going to become a prevalent method of treatment.



### Conclusion

“Life is a never-ending stream of problems that must be confronted, surmounted and solved” by Mark Manson. Digital Twin technology will surely be a perfect solution for a person’s medical issues due to all of the advantages discussed fruitfully in the above paper.

Due to the rise for the need of personalized precision medicine in today’s ever-changing world, creating Digital Twins has become more of a necessity than a fascinating indulgence. It will prove to be a revolutionary innovation and will enhance medicine by leaps and bounds. It will supersede all physical analysis and will dominate medicine in the future.

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7. Biology Teacher- Ms. Pooja
8. IGCSE Coordinator- Ms. Nisha

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## IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT

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Atigre, Maharashtra.

### Abstract

All the developing and developed businesses have one thing in common that is the presence of a dominant character, leaders. These businesses make use of different types of leadership styles including: Authoritarian, Participative, Delegative, Transactional, and Transformational. Some organizations make use of only strong, powerful and influential leaders while other organizations use various leadership styles. This paper is first differentiating between manager and leaders and later combining the skills of leaders and the impact that different leadership style has on businesses and at last come to a conclusion on what type of leader would suit what leadership style.

**Keywords:-** Corporation, leadership skills, management, Organization, Leaders, Authoritarian leadership, Participative leadership, Delegative leadership, Transactional leadership, Transformational leadership.

### Introduction

What we do each day, like being paired up in corporations to participate in initiatives or speaking with distinctive humans for specific reasons, for example, speaking to your instructors for a suggestion you may need to place forth or to your classmates to discuss a query or a topic; is a manner wherein all of us learns the important leadership skills. Leaders play an important role in business, as they are the personalities who point on the betterment of the firm/ company, issue duties to different people consistent with their ability and the mission that suits them to the maximum and so that it will provide out fantastic feedback. This paper makes a specialty of mixtures made through the use of the different sorts of leaders and managers, to locate and examine the fine mixture that might shape the fine management to be applied in an organization.

### THEORY

**In this paper we will be looking at the following points:**

- What leadership is
- What management is
- Roles of managers and leaders – figure 1
- Types of leadership styles
- Table 1 leadership skill set analysis
- Table 2 impact of different leadership styles.

While Leadership may be a process of guiding followers or individuals within the right path by an individual who understands the importance of all the possible obstacles, guiding these individuals, sometimes making difficult decisions sound simple and establishing achievable goals and also ensuring that there's efficiency and cooperation within the group and ensuring

each individual receives attention and is heard to; management is that the art of conducting and supervising. The book ‘Leadership in organizations ‘There could be a difference between leaders and managers’ by David I. Bertocci says that “Leadership, in contrast, is about vision, big picture views, and dealing with change. a part of the explanation leadership has become so important in recent years is that the business has become more global, more competitive and more volatile.”[1]

Management could be a set of principles which relate to the assorted functions like planning, organizing, staffing, directing, coordinating, controlling etc. which are helpful in achieving organizational goals. The book ‘Leadership in organizations ‘There could be a difference between leaders and managers’ by David I. Bertocci says that “Good management brings calmness and stability to a business and tries to eliminate what sometimes will be chaotic circumstances that threaten their very existence. Good management brings a couple of degree of order and consistency to the quality and profitability of products or services.”[1] While some organizations and corporations are led by leaders, others are led by managers, the most important difference between the two is that Leadership woks on the idea of the larger scenario while Management is about the steadiness in a corporation.

**Roles of managers and leaders:**Figure 1: the difference between leadership andmanagement [2]



In Figure 1 the foremost noticeable difference between a manager and a leader is that managers just follow their seniors, where they follow what power they're given while leaders develop power over time and receive unlimited respect. Leaders show their followers the way to do something while managers just tell you what's to be done. Organizations/ businesses are initially made with the intension to present people opportunities in sectors they're good at yet over time, the standard of providing such services is what they begin to lack. The article by Abbas Umar Ibrahim and Cross Ogohi Daniel “The role of a leader in a corporation is to assist identify worthless goal, help devise appropriate strategies to realize such goals and supply direction and motivation for the group so set goals is attained. The leader must recognize the value system that operates during a type of work group and situation. They have to hear questions yet as provide answers. He must comprehend the issue of being a subordinate so on understand the fear.” [3]

As the title of the paper suggests, ‘Impact of leadership in business management’; I'll be analyzing on how leaders should be like and with what best leadership quality. We will be looking at the different leadership styles. Later in a table analyzing what type of skills this person



should hold for the accurate running of that leadership style and then we will be looking at the impact of such leadership styles on the business and the employee.

### The 5 leadership styles that can be used: [3]

1. **Authoritarian Leadership** – “Authoritarian leadership, also referred to as autocratic leadership, could be a management style during which an individual has total decision-making power and absolute control over his subordinates.” [4]
2. **Participative Leadership** - “Participative leadership may be a kind of leadership during which all members of the organization work together to create decisions. Participative leadership is additionally referred to as democratic leadership”[5]
3. **Delegative Leadership** – “A delegative leadership style focuses on delegating initiative to team members. this will be a successful strategy if team members are competent, take responsibility and like engaging in individual work.”[3]
4. **Transactional Leadership**– “This may be a style used between leaders and their followers, where leaders provide rewards, punishments and exchange other things to urge the duty done.”[3]
5. **Transformational Leadership**– In this style the leaders inspires their followers with a vision and encourage them to achieve it.

Table 1 Leadership Skill set analysis.

Skills	Authoritarian	Participative	Delegative	Transactional	Transactional
1. Genuine			✓		
2. Purposeful	✓				
3. Grounded		✓	✓		✓
4. Connected		✓		✓	
5. Supportive		✓	✓	✓	
6. Resilient		✓			
7. Curious		✓			
8. Engaged	✓		✓	✓	
9. Optimistic		✓			✓
10. Innovative			✓	✓	
11. Interactive	✓	✓			
12. Decision maker	✓			✓	
13. Organized	✓	✓			

Table 2 Impact of various leadership styles

Impact	Authoritarian	Participative	Delegative	Transactional	Transactional
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Motivation		Increased	Increased	Increased	Needed consistently
Job Satisfaction		Increased			
Productivity	Increased	High level	Increased	Increased	Increased
Mistakes	Reduced			Reduced	
Time taken	Reduced			Dependent on the system	
Group collaboration	Reduced	Increased			
Participation rate		Increases	Increases	Increased	
Employee turnover rate	Increases				Lowered
Relationships	Reduced	Great	Good	Amazing	
Morals		Valued		Not valued	High
Vision					High value
Creativity	Killed	Encourages	Increases	Minimized	
Innovation	Killed		Increases	Minimized	
Positive vibe			Is created		
Decisions	Made by leaders	Poor and time consuming.	Faster		
Communication		Fails		Consistent	
security		Issues rise			
Chain of command	emphasized		Not properly appointed		
Other			Causes difficulty in adapting to change.	Leaders create easy to follow systems. Employees chose reward system.	Inspires his/her followers.

### CONCLUSION

After analyzing all the facts and figures, the best leadership style to be used in a business could be Participative with a mixture of Authoritarian style; as there are less mistakes made, and decisions are made by leaders making it less time consuming. Plus there is also an emphasized chain of command, thus increasing the efficiency. In this business the employer must employ grounded, connected, supportive, resilient, good decision maker, engaged, purposeful, and organized leader(s) for each of their team.

### ACKNOWLEDGEMENT

I would like to thank all my teachers for presenting me with this opportunity and providing all the support I needed. I would also like to thank my family for supporting me with their endless love. I would also like to present my gratitude towards my wonderful school/ university for



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## INTERPRETING TRANSFORMATIONAL LEADERSHIP AND ITS IMPACT ON ORGANIZATIONAL PERFORMANCE

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Euro school Airoli

### Abstract

Leadership has evolved into a vital component of an organization's success. Transformational leaders encourage employees to be more involved in their job, which results in increased efficiency and satisfaction, which leads to better management and organizational performance. In theory, transformational leadership is linked to a number of different organizational outcomes. The purpose of this study is to examine the notion of transformational leadership as well as existing methodologies and research in the field. The primary goal of this research is to demonstrate the evolution of transformational leadership by looking at other aspects that influence this leadership style.

**Keywords:** *transformational leadership, organizational performance, organizational outcome*

### Introduction

Due to a high level of interest in the leadership phenomenon among scholars and practitioners, the literature on the topic of leadership is wide and growing quickly. Despite the fact that many leadership theories have been developed and studied extensively, transformational leadership has become the most widely researched over the last two decades due to its impact on increasing positive attitudes and subordinate performance. [1], [9].

Important characteristics emphasized by transformational leaders include inspiring subordinates to set ambitious objectives and providing them with the confidence they need to exceed their expectations and reach their full potential [8].

Transformational leadership has been defined as “the behavior of a leader that transforms and inspires subordinates to act and exceed their expectations when they go above and beyond self-interest for the good of the organization.” [1].

### Theory

The specialised literature dealing with transformational leadership was initially reviewed in order to construct the conceptual model. Empirical study on this leadership style has linked it to organisational innovation, intrinsic motivation, creativity, learning orientation, group identity, and, last but not least, organisational performance. In 2009, Gumusluoglu and Ilsev conducted a study that looked at the relationship between transformational leadership, individual creativity, intrinsic motivation, psychological empowerment, and organisational innovation. 163 employees and leaders from 43 Turkish software development companies participated in the study. According to the findings, transformational leadership has significant influence on both



individuals and organisations, thus managers should empower their people to motivate them. Employees' creative performance is considerably improved by this method. The findings should also motivate managers to participate in transformational leadership practices in order to improve employee performance and assist the firm innovate. [6]

Herman and Chiu used a sample of 280 employees and 40 managers working in 40 banking branches in a Chinese metropolis to assess transformational leadership and other characteristics such as individual distinctiveness, group affiliation, creativity, and organisational behaviour. [7]

According to the findings, firms should focus on teaching managers to recognise and foster both individuality and variety within a group. They should employ idealised influence and inspire motivating behaviours to guide subordinates when and where group cohesiveness and civic conduct are necessary. Transformational leadership has been proven to have a considerable impact on organisational innovation, as well as learning and market orientation.

Transformational leadership is an important component in businesses that is often measured with the Multifactor Leadership Questionnaire. According to research conducted over the last decade, transformational leadership is best suited to tasks that demand regular engagement among people, unstructured problems that require creative solutions, and the creation of a shared vision.

Transformational leadership, as can be seen, has piqued the curiosity of organisational scholars. Personality qualities have been linked to transformative leadership in other studies [5]. Transformational leadership must be handled in more complicated and closely associated variables encouraging the establishment of this type of leadership, since challenges in the present economic climate are unforeseen and unexpected information.

Leadership's influence on business performance continues to gain traction in the media as well as other fields of study like psychology and sociology. Because academics think that leadership style efficiency has a direct link with company performance, one of the most important areas of leadership study is evaluating successful corporate leaders to see what sets them apart from their counterparts [3],[4]. Several specialists have studied the relationship between transformational leadership style and desire to work over time. For example, Barbuto found that transformational leadership has a positive and significant impact on intrinsic motivation, but individualised consideration has a negative impact. [2]

Transformational leadership has been found to be a highly essential feature that is strongly connected with management and organisational success over time. The capacity of a leader to challenge subordinates to achieve a common objective is measured by his or her effectiveness as a leader. The principle of transformational leadership is crucial, and several studies have found a link between it and other dependent variables including employee happiness, commitment, motivation, and performance [10].

### Conclusion

Establishing a vision and action plan to guarantee that firms are customer-centered, as well as creating a favorable atmosphere for employees to maximize productivity and creativity, are all part of dynamic and efficient leadership. At all levels of businesses, transformational leadership is becoming more crucial and visible. As a result, executives should understand how to empower subordinates in order to build talented teams that will boost the organization's production.



Transformational leaders inspire others by satisfying and amplifying the needs of each of their subordinates via personalized appreciation, intellectual stimulation, and the hunt for new sources of information. As a result, determining the appropriateness and congruence of individual and organizational demands is critical to the transformational leader's success. Transformative leadership entails having an influence on the transformation and development of individuals, groups, and organizations, resulting in improved quality of life, efficiency, and performance in a variety of settings. As a result, at all three levels of organizational behavior: organizational, group, and individual, leadership is critical.

To conclude, as a result of the foregoing, transformational leaders engender increased participation in their subordinates. Higher efficiency and satisfaction arise from this participation, which leads to improved management and organizational performance. In theory, transformational leadership is linked to a number of different organizational outcomes. From a theoretical standpoint, the literature provides empirical data that supports the idea that transformational leadership leads to favorable organizational outcomes.

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### UNDERWATER: ONE WAY TO BOAST THE BREAKTHROUGH

**Sachee Galankar**

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#### **Abstract**

Underwater communication is sure met with certain obstacles, a quick rundown of a big hindrance that is Ocean floor mapping, Noise interference during communication and inefficiency of acoustic waves that result into huge time intervals between communications. Unravel methods to improve and the results of new improvisation techniques and conclude a meaningful solution to it. Over the years, evident modifications used in underwater communication and boasting the breakthrough of these technologies.

**Keywords:-** *Doppler effect, SONAR, electromagnetic waves, Column samplers, Wireless transmission and acoustic systems.*

#### **Introduction**

Difficulties in underwater communication include the delay of acoustic waves which results into late transmission and leads into missing important information from the sender. There has been a recent advancement in optical wireless communication including the requirements for the transmission speed and distance of UWC (Underwater wireless communication) technology. Method to improve and implicate a noiseless communication.

#### **Theory**

Underwater acoustic communication has proven to be much of a practical approach comparatively, it can transmit data up to a long distance through waves in water. UAC suffers from a relatively low data rate on the order of kbps due to the low system bandwidth of about kHz, and the low bandwidth is limited to the low carrier frequency (10 Hz–1 MHz). The UAC propagation speed of acoustic wave is five orders of magnitude lower than radio which leads to a delay of 0.67s per kilometer. Also considering the fact it is uneconomical. As the light propagation in the underwater environment is complex, underwater transmission channels are extremely challenging. Light propagating in the aquatic medium suffers from attenuation due to the severe absorption and scattering effects. The emerging technology has made astonishing advancements.



Experiment	Light Source <sup>a</sup>	Modulation Scheme <sup>b</sup>	Channel Length	Data Rate	Reference
	450 nm LED	16-QAM-OFDM	2 m	161.3 Mbps	[7]
	470 nm LED	DPIM	9 m	0.6 Mbps	[5]
	405 nm LD	OFDM	4.8 m	1.45 Gbps	[8]
	445 nm LD	OAM-OOK	2.96 m	3 Gbps	[9]
	450 nm LD	16-QAM-OFDM	5.4 m	4.8 Gbps	[10]
	450 nm LD	16-QAM-OFDM	6.6 m	3.2 Gbps	[11]
	520 nm LD	NRZ-OOK	7 m	2.3 Gbps	[12]
	532 nm LD	NRZ-OOK	2 m	1 Gbps	[13]
	660 nm LD	128-QAM-OFDM	6 m	1.324 Gbps	[14]
	Red LD	OOK	30 cm	20 Mbps	[15]
	450 nm LD	NRZ-OOK	12 m	2.0 Gbps	This work
	450 nm LD	NRZ-OOK	20 m	1.5 Gbps	This work

<sup>a</sup>Light sources: LD stands for laser diode; LED stands for light-emitting diode.

<sup>b</sup>Modulation techniques: NRZ stands for non-return-to-zero; OOK stands for on-off-keying; DPIM stands for discrete pulse interval modulation; QAM stands for quadrature amplitude modulation; OFDM stands for orthogonal frequency-division multiplexing; OAM stands for orbital angular momentum multiplexing.

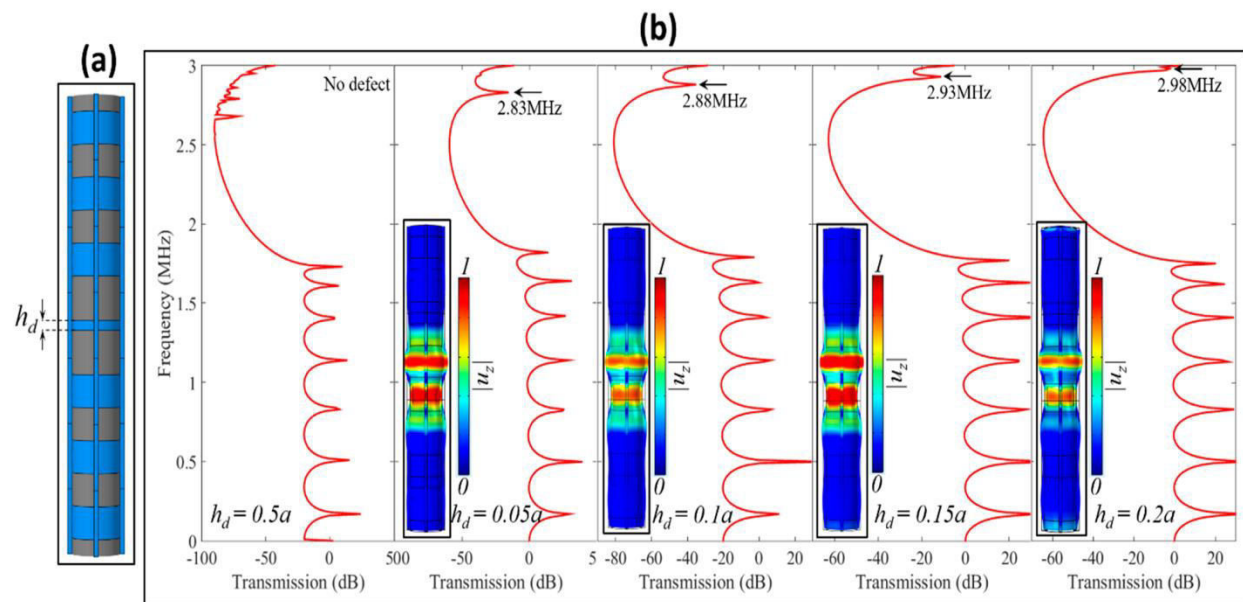
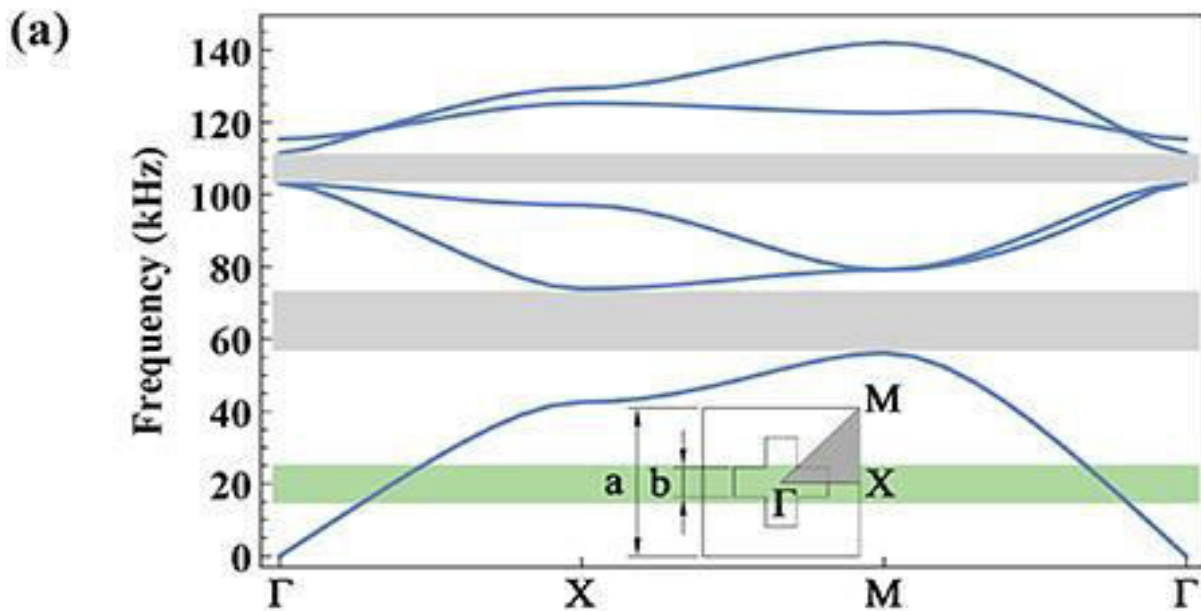
In order to improve the performance of UWOC, apart from optimizing the design of transmitting and receiving devices, the spectrally efficient modulation techniques have also attracted great interests and attention in academic and industrial communities.

- 1.) Using a Vector hydrophone (which receives acoustic waves)
- 2.) Using sound barrier (suppressing of local emission interference)
- 3.) Stainless steel cabin (equipped with battery, signal processing board, power amplifier, etc.
- 4.) Sound barrier (suppressing of local emission interference transceiver) [transmitting and receiving]

### Result

Advancement in sensing technology can save major time loss into communicating. Acoustic signals are mechanically-actuated signal, the dynamic nature of the underwater medium disrupts the signal quality. The existing bio inspired system around us in ocean is a rich depository for ideas to man made issues. Intricate and precise measurements for instance ocean floor mapping, smooth transmission of signals for underwater communication that includes being updated with emerging technologies and having a wide variety of options during disaster management which hinders the communication.

## Interpretation



The above diagrams explain how acoustic waves behave depending on different frequencies.





### Discussion

UWOC technology has developed rapidly and achieved many notable results in recent years. Achieving a reliable long-distance and high-speed data transmission is one of the challenges for the UWOC system. The short communication distance is a major obstacle to limit UWOC development, which originates from serious absorption and scattering of the optical waves.

### Conclusion

The recent progress in terms of the key technologies including system transmitters and receivers, modulation formats and underwater channels is evolving along with time. Emphasis is placed on the techniques to achieve high-speed, long-distance and practical UWOC systems.

### Acknowledgements

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### COMMUNICATION IN THE ARMY

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#### Abstract

Communication is when the sender sends a message which is received at the receiving end. Communication in the army needs to be effective to improve the results. Effective communication needs to be short, fast, straight to point and spoken without any disturbance.[6] Communication plays a vital role in the army. The method of communication has evolved over the years. The communication used by the military system should be the one which is suitable for use on land.

**Keywords:** *communication, technology, wireless , network, electromagnetic spectrum*

#### Introduction

The current communication method used seems to be wireless communication or 5G. It is the most effective today as it can travel through a large area using waves (electromagnetic spectrum). There is a conference held every year at New Jersey called Network Modernization Experiment or NetModX 20. It is held every year in order to develop new technologies for the communication in the army . There are various tests which the equipment or technology developed have to go through.[5]

#### Theory

Mission critical networks enable intelligent and automated operations. To be able to act quick in time you must be able to exchange accessible data in short time efficiently with high speed. [2]

With 5G in defence system it will be easier to adjust to industry 4.0 technologies. This will enable to create automate reliable, secure and scalable communication networks across all operating areas. The advantages of this would include faster innovation system with improved command, control, computing, communications, cyber, intelligence, surveillance and reconnaissance or known as the C5ISR system [2]

For the army on the basis of communication 5G could improve ISR systems and signal processing, enable new command-and-control applications, and streamline logistics. 5G also could give the military access to augmented and virtual reality used in ICT.[2]5G smart warehousing distributes command and control and the use of dynamic spectrum.[1]

To do all this, 5G will operate on three segments of the electromagnetic spectrum:

Low band, which works at frequencies below than 1 GHz;

Mid band, which works at frequencies between 1 GHz and 6 GHz; and

High band, or called as millimeter wave which works at frequencies between 24 and 300 GHz.



Low band and mid band together also are called sub-6, and this is where all of today's so-called 5G cell phone services work.

Low band and mid band together also are called sub-6, and this is where all of today's so-called 5G cell phone services work.

With the help of high bands use of millimeter wave, this allows faster data transfer rate which most telecommunication companies think is necessary for autonomous vehicles like virtual reality (VR)

However there are some disadvantages of it. The RF signals in 24-300GHz can be easily absorbed by rain or disrupted by physical object like building. With that the 5G millimeter also requires installing many more cell sites than those working in the lower band. Installing more cell sites also comes at a higher cost and will take more time for development than the sub-6 approach. The 5G deployment will rely on millimeter wave technology for high speed, high bandwidth communications and on sub-6 signals for nationwide coverage [1]

### Experimental

The Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center – a part of Army Futures Command's Combat Capabilities Development Command (CCDC) – will test potential vulnerabilities within systems being developed for use by the Army[5]

The result of the experiment will allow the C5ISR Center's collaborative partner, Program Executive Office Command, Control and Communications-Tactical (PEO C3T), to take decisions concerning Capability Set 23 – a collection of network capability enhancements informed by experimentation, demonstration and direct Soldier feedback, scheduled to be fielded in 2023[5]

THE C5ISR also aims to leverage multi layered architecture within the communication network. The same aim for the capability test 23.[5][3]

### RESULT

Technology which was developed as a part of CAPSET 23 is the modular communication node-advance enclave or known as the MCN-AE which enables soldiers the ability to communicate over secure network.[3]

The MCN-AE augment an existing intelligence network allowing users to connect all their resources they were using when working for the traditional standalone network but now for the army tactical network. Each of the MCN-AE fits into a portable suitcase sized case reducing the traditional system weight and power requirements.[3]

In the traditional system soldiers which performed tactical, intelligence and operation were required to use individual communication network to relay information but with MCN-AE,the service covers all the individual network onto one tactical network[3]



### Discussion

Network modernization is one of main of the main concerns being spearheaded by the army futures command.

To attain their goals, the army is conducting a series of two year capability test. Each set has a number of intention including unified network, common operating environment, joint interoperability/coalition accessible and common post mobility survivability according to the service. The army is done with the design review for the next round of network tools called capability set 23[3]

The technology being developed within the capability set 23 will be concentrate on medium weight Stryker brigades that will leverage multi layered architecture of communication networks. One of the top efforts for this is known as command, control, communication, computer, intelligence, surveillance and reconnaissance or known as the C5ISR.[3]

C5ISR is an acronym for Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance, and Reconnaissance. It enable information dominance and decisive lethality for the networked Soldier. CMOSS is streamlining the integration of a number of capabilities into one platform [3]

As part of the effort, the Army is using the OpenVPX standard, a hardware form-factor computing system that attaches to the chassis of a Stryker vehicle and allows capabilities to be fielded in the form of processor cards.The CMOSS concept can be put into various types of systems[3]

Officials are working to ensure that the CMOSS concept stays relevant as technology continues to rapidly evolve, said Jason Dirner, an electronics engineer with Army Combat Capabilities Development Command's Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance Center(C5ISR)[3]

### Conclusion

On the current battlefield, for long term communication usage soldiers in the army rely on a single geosynchronous connection or satellite .MCN-AE was the new technology which was developed in the conference of 2021. It is helping the soldiers communicate over secure network. The CMOSS system is to be stayed relevant throughout the years to develop new communication system through technology. {3}

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### THE NEXT GEN OF MARKETING

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#### Abstract

In this new tech-driven world, there is a major shift in the field of business. As the scope of earning via e-commerce is increasing, so is the way to market it. Digital Marketing is the newly growing field of interest in many young minds. The old-fashioned ways of marketing have been taken over by the new-age efficient methods. As I am a techno-savvy person, I have a keen interest in learning about new, emerging advancements. So, I would like to present my knowledge, which I hope will surely help somebody who might find the field a potential career and even bring the conclusion of how it has affected both small-scale and large-scale business.

**Keywords:** Digital Marketing: - Using digital tools and applications to promote products on digital media. Influencer Marketing: - Sponsoring or using content creators to use and promote your product to their audience. E-Commerce: - Online sites and apps that give us the options to buy multiple products of different types at our fingertips from anywhere around the world. Affiliate:- A brand or a company to which your company is associated for the promotion of your products.

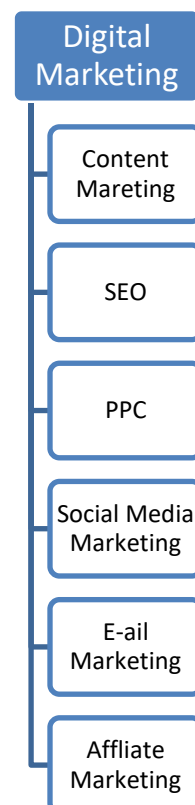
#### INTRODUCTION

The field of digital marketing is a new-age booming field. Every single business needs exposure. If it is not given exposure to gain recognition, it cannot work in the long run. The exposure needs to be built around it to allow the company to excel in future. Thus, marketing the product allows it to gain the company some exposure and grow faster. Every single company needs a “face value.” This claimed “face value” can be enhanced much easier with today’s modern solutions. If the marketing is strong, the longer the face value lasts, the longer a company can stay in progress in the market. In the following info ahead, you shall understand some modern techniques of digital marketing and even talk about how the market statistics are changing and how it influences the small scale and large-scale companies.

#### Theory

Whenever you market a product, you need to make sure you make it unique. It needs recognition. Showing it to the masses like it is “the product” they should go out and buy. You need to understand the branches of digital marketing:-

1)Content Marketing:- Make the content relevant to your products. Use modern techniques and trends to create interactive videos to campaign the





product to the masses. Make sure there is enough traffic so that you can be funded for moving forward with your marketing process.

2)SEO:- SEO or Search Engine Optimization is the process in which you make sure to put content that matches the search results browsers show on a website. Whenever a person searches for something online, the most relevant site according to the search is placed at the top and the rest are kept below. If your content matches with searches and becomes more relevant your site will show up at top of the search recommendations, bringing more traffic to the site.

3)PPC:- This step is important for the expansion of traffic. Traffic can't expand just by making your site more easily relatable or relevant, you need to even make your say. It can be done by making ads. You will need to pay a certain fee per click, hence the name Pay-Per-Click or PPC.

4)Social Media Marketing:- This is a really helpful method in today's world. Multiple social media sites are open to all for marketing their products. Companies can hire a team who look forward to regular posting of content about their products, launches and offers. They can also collaborate with creators and influencers to promote their products through sponsorships or paid promotions.

5)E-mail Marketing:- After you have gained traffic, there are chances that you might lose some newly arrived audiences. You can use an e-mail automation system that generates explanatory short emails about your products to let the new audience about their importance.

6)Affiliate Marketing:- In this way, you bring in an offer on affiliate networks to partner with a brand that will promote your products on their site or profiles. They get a certain commission for their promotions. This is helpful and can sometimes also decrease your marketing cost. There are many affiliate networks in the world like Amazon Associates, Flipkart Affiliate, CJ Affiliate, Rakuten, eBay Partner Network, Walmart Affiliates and many more.

### Experimental

The following technique is called the "Blind Pepsi Challenge". It was first done in 1981 by Pepsi and has been copied since. Following are the steps:-

- 1) Take two cans/bottles, one Pepsi and one Coca-Cola.
- 2) Blindfold a person and tell them to drink both of them.
- 3) Tell the person to remove the blindfold and do it again.

### RESULT

The result is shocking, people when blindfolded chose Pepsi because of its taste, but when not, they chose Coca-Cola. The reason? Marketing. Many brands have fallen behind in competition only because of a few hiccups in their marketing strategy. It is even the same for digital marketing. A few hiccups in it can cost you a major loss. Even big brands have fallen just because they lost on the marketing side. Big titan companies have gone tiny just because of simple errors.

### Discussion

Well now that we know about digital marketing and how it works, we need to know about its effect on the small scale and the large-scale businesses.

For small scale industries, it is a must. Digital Marketing gives them an equal level field as their competitors, thus giving them an equal chance of growth. It even helps in faster and better



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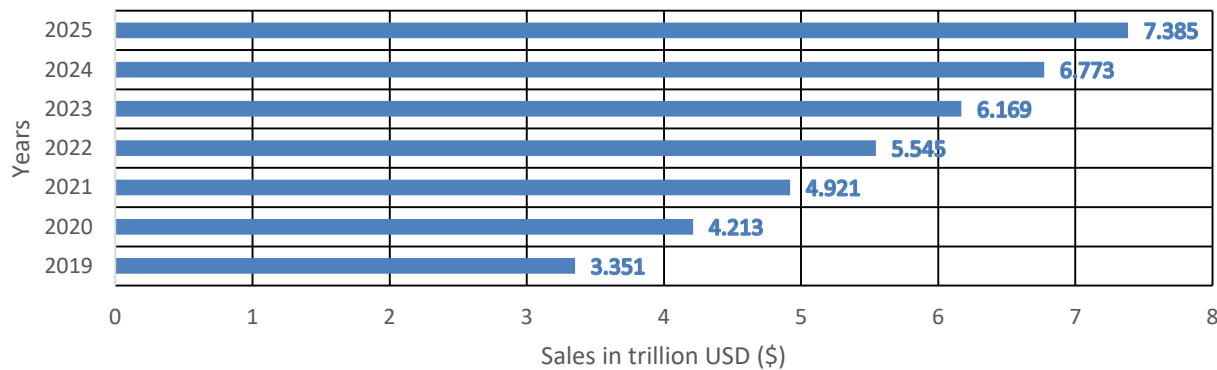
exposure than old school marketing techniques because their competitors might already be great at it and it is less likely to gain crowd using those techniques. It will cost them but they will have to sensibly re-invest in their business. They might have to bring in more public funding and also increase their sales to cope with the expenditure.

For large scale industries, it is a helpful tool for consistent growth. They need to have their presence or new upcoming startups can also bring them down. It is their way to stay connected to the upcoming generation and convert them into potential customers. For this, they need to bring in new minds and also put them under leadership with like thoughts so that they work as a good team.

But is this the reality? It is a yes and a no. The reason is that digital marketing is sometimes neglected and this can get serious in certain situations. The following 2 graphs show you how will digital marketing be affected.

<b>Years</b>	2019	2020	2021	2022	2023	2024	2025
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Global Ecommerce Sales (2019-2025)



<b>Sales Growth rate (%)</b>	20.5%	25.7%	16.8%	12.7%	11.2%	9.8%	9%
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As you can see, the amount of money made by sales increases, but the growth rate is down. This shows us that fewer companies will be selling their products. This might also be due to the recession but digital marketing can also be the reason. The companies that went out of business might not have marketed their products well, giving their competitors a chance for growth and then losing it all when in recession as they have hardly few people left paying for their products through which they can't clear of their expenditures if there is a recession or even if there isn't any.





### CONCLUSION

In conclusion, Digital Marketing is an important pillar of support for a company to have a consistent long-term run and is important for a company to look forward to following a few steps while making a marketing strategy:-

- 1) Make sure you have enough funding and sales to cover your expenditure.
- 2) Re-invest enough in your marketing to keep it up to date.
- 3) Make your presence online.
- 4) Use the help of online tools and resources to make your marketing team better and stronger.
- 5) You can also collaborate with marketing firms to make it more cost-effective.

### Acknowledgements

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## DIGITAL MARKETING AND ITS ROLE IN THE BUSINESS SUCCESS OF SMALL AND LARGE ENTERPRISES - A PERSPECTIVE

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### Abstract

The purpose of this research paper is to demonstrate the impact of digital marketing on producers, suppliers and mainstream consumers. This paper commences with an introduction to digital marketing, followed by the differences between digital marketing and traditional / conventional marketing techniques, how digital marketing affects small and large businesses, pros and cons of digital marketing, types of digital marketing, and lastly, the significance of digital marketing in today's day and age. All of this is based on my experiment, its findings (captured later in the paper) and additional research done by me on the internet.

It is no surprise that the world is shifting from a conventional and black & white space, to a new, technologically advanced and colourful place to live in. As the world is becoming more and more technology friendly, the use and relevance of digital marketing is increasing exponentially. The Covid-19 pandemic has changed the world forever. Amongst other things, it has significantly altered the supply chain across industries, consumers' purchasing power, consumers' needs & preferences and producers' production capabilities. Given this paradigm and game changing shift in market dynamics, all businesses, big and small, are now expeditiously realizing that they need to move from traditional marketing to digital marketing of their goods / services. Digital marketing was already the 'next big thing' on the anvil. The pandemic simply fastened this organic process.

**Keywords:** Digital Marketing, Traditional Marketing, Enterprise, Social Media, Internet/Electronic Medium.

### Introduction:

*“Digital marketing” is a collection of different marketing techniques that make use of electronic mediums or the internet to propagate a product, service, brand or concept.* Simplistically put, it refers to relatively inexpensive marketing using the prowess and global reach of internet.

### Digital Marketing – The Concept In Detail:

Today, all types of businesses use some or the other form of digital marketing to advertise their products or services. The concept of digital marketing evolved in the early 1990s, and since then, it has completely changed the way businesses make use of their earmarked funds for marketing.



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Digital marketing can be carried out through several mediums such as email, Instagram, Facebook Marketplace, LinkedIn, Google Ads, SMS campaigns, WhatsApp campaigns, so on and so forth. Digital marketing comprises of several ingenious strategies such as content marketing, pay-per-click, search engine optimization (SEO), social media marketing, paid advertising, email marketing, instant message marketing, affiliate marketing, influencer marketing, mobile marketing, video marketing, audio marketing, virtual reality marketing, so on and so forth. Businesses typically adopt one or more of these strategies basis their specific business needs and financial budget. Digital marketing's popularity today is like never before.

Without any doubt whatsoever, it is the most popular, cheap and widely used mechanism of marketing in recent times. Not all can afford expensive newspaper or television advertisements, but every business, big or small, can definitely afford some budget for digital marketing! The power and effectiveness of digital marketing lies in its innate ability to empower one and all. A well-structured digital marketing campaign today has the power to "make" a brand in a short duration without boring a hole in one's pocket. It would not be inappropriate to say that digital marketing has ushered in a new era of robust marketing dynamics which does not discriminate and helps businesses and brands grow exponentially in a short span of time. In fact, the spate of start-ups and small businesses one sees today is largely because of the magic of digital marketing. Digital marketing has given birth to a new age of successful entrepreneurs and sociopreneurs, who would have otherwise spent their lifetime doing mundane desk jobs for large businesses.

### DIFFERENCES BETWEEN DIGITAL AND TRADITIONAL MARKETING:

DIGITAL MARKETING	TRADITIONAL MARKETING
Marketing / brand building is done with the help of an electronic medium using the internet.	Marketing / brand building is done with the help of traditional methods like flyers, posters, television ads, newspaper ads, etc.
Cheap	Generally expensive
Response from consumers is quick	Response from consumers generally takes time
Benefit arising from a digital campaign can be easily and quickly measured	Benefit arising from the campaign may be difficult to measure in most cases
Generally confined to the geography or population targeted	Has a larger reach in most cases
Is generally followed up with back-to-back campaigns to create the repeat impact	Generally expensive, and hence, limited follow up campaigns possible (if at all done)
It is largely artificial intelligence (AI) driven – hence, the campaign builds a target audience and targets it repeatedly from multiple touch points	Except in some rare cases, it is generally not AI driven
Helps reach the target audience at a low cost	Helps reach a larger audience at a higher cost
Generally very effective	It is effective too, but at a much higher cost
It is used by one and all and shall grow exponentially with time	It is used only by those who can afford it and its usage shall reduce with time



### HOW DOES DIGITAL MARKETING IMPACT SMALL AND LARGE BUSINESSES:

Digital marketing is a cost-effective and result oriented methodology of advertising goods or services. It can help both, large and small businesses. In both types of setups, digital marketing promises huge returns for a small investment (which for sure, the entrepreneur will not regret in the long run). In fact, a host of start-ups and small businesses have become huge in the last decade (some of them have become Unicorns too), thanks to digital marketing. It would not be an exaggerated claim to say that most businesses are what they are today only because of digital marketing. If product / service excellence of the business were to be equated to a car, digital marketing acts like the fuel which runs the car. A car does not move an inch until it is fed with fuel. So is the scenario of business today. It does not move forward until it is bolstered with digital marketing! Those repetitive ads which keep on coming before us on our Facebook page time and again subtly help build a strong image in our mind of that brand over a period of time. A brand which consistently comes before us for a while suddenly becomes familiar to us, and that is the first brand we subconsciously remember, when we have to buy a product or service related to that brand. That is the power of digital marketing! It can so easily build a powerful and strong “brand recall” in a short period of time.

The biggest USP of digital marketing is that it smartly chose to target the hinterland of human exposure and existence, i.e., the internet. Rich and poor, big and small; everybody today is on the internet. Digital marketing only successfully leveraged this fact and made the most out of it. In the last decade, businesses have very smartly explored different forms of digital marketing simultaneously to create a multipronged impact on consumers. When a brand constantly keeps appearing in front of us on our Facebook, Instagram, Google searches, LinkedIn, etc., it is hard to disregard it, even if we want to. A couple of decades back, since marketing was a very expensive affair, it was a privilege exercised only by a handful of businesses who could afford it. Today, every single business can market rampantly and effectively, and that too in a very economical and pocket friendly budget, thanks to digital marketing. Be it a small venture running from a garage or home balcony or be it a large MNC selling its products to the world at large – today, nobody can survive without digital marketing. In fact, marketing gurus are predicting that in the decade to come, digital marketing shall constitute more than 80% of the overall marketing spent in all businesses.

Given the rising importance of digital marketing, a host of digital marketing campaigners, influencers and experts have sprung up, and using their services could be worthwhile for businesses; thanks to the hands-on experience and awareness of different strategies in digital marketing they bring on table. In fact, every marketing agency in the world today has a very strong digital marketing arm, and without any doubt whatsoever, this is the fastest growing arm in every such agency! Digital marketing is here to stay, flourish and rule in the decades to come for sure.

### PROS AND CONS OF DIGITAL MARKETING:

#### ADVANTAGES:

- 🔗 Targeted reach (population / geography)
- 🔗 Increased engagement
- 🔗 Brand building in an efficient manner
- 🔗 Cost-effective when compared with traditional forms of marketing



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- ❏ Time saving and immediate results
- ❏ Multipronged approach possible
- ❏ Can be started and paused at one's free will
- ❏ Can be customized as per one's budget
- ❏ Simple and easily doable methodologies
- ❏ Does not need elaborate arrangements and procedures – can be easily used by one and all
- ❏ The success of any digital marketing strategy is easily and objectively measurable on a real time basis
- ❏ Can be managed by the entrepreneur himself / herself without seeking professional help
- ❏ Has successfully created several brands and helped businesses grow exponentially

### **DISADVANTAGES:**

- ❏ Piracy and copyright issues could crop up in some cases
- ❏ Since it is unregulated, legal issues could spring up in certain cases
- ❏ Fully relies on the internet and can be sometimes unreliable
- ❏ One could end up wasting funds if the campaign is not run with the right target audience
- ❏ Extreme competition exists at all times
- ❏ Too much of digital advertisement clutter all around, which could reduce the impact of the campaign
- ❏ Digital advertisements are generally skipped by the target audience – this could lead to waste expenditure for the digital marketing investor
- ❏ Not everyone is technology friendly – hence, reaching out to such “technology unfriendly audience” may be difficult
- ❏ If over-done, digital marketing campaigns could end up irritating the target audience rather than winning them over
- ❏ 90% digital ads go unnoticed - how much impact the rest 10% will create is always ambiguous
- ❏ Needs expert guidance and smart management of the multipronged approach – a badly managed digital marketing campaign could lead to huge wastage of funds

### **TYPES OF DIGITAL MARKETING IN TODAY'S DAY AND AGE:**

- 1) **Search Engine Optimization (SEO):** It is the act of making sure that the target website is listed at the top of suggested websites when a user searches for something on an internet search engine with relevant keywords. Users often tend to visit only the first 2-3 websites which appear on their search engine tab. SEO, when managed well, leads to a greater number of footfalls on the website of the product / service, leading to more sales. SEO is a classic and organic methodology of sales growth.
- 2) **Pay-per-click:** It is the act of promoting the link to a website in the form of an advertisement, so that the product / service the business owner is offering on his / her website get widely marketed. Here, the business owner needs to pay a pre-decided amount of money, but only if the link gets clicked. A click means that a potential customer has evinced interest in the business owner's product / service, and this increases the chances of conversion into sale. Google Ads is an example of Pay-per-click. It is most often used by firms that have just entered into a particular industry and need to grow their sales in a short span of time. Pay-per-click is a rewarding



inorganic methodology of sales growth.

3) **Social Media Marketing:** As the name suggests, this form of marketing involves marketing through social media platforms such as Facebook, Instagram, YouTube, etc. Here, marketing is effectuated through promotion of goods and services by online creators in the form of YouTube videos, IGTV videos, Instagram reels, so on and so forth. This form of marketing also includes paid advertisements on social media such as Facebook Ads and YouTube ads. Social media marketing is an inorganic methodology of sales growth.

4) **Content Marketing:** This form of marketing involves building content of the product to be sold, in the form of videos or reels. These videos / reels are released on platforms like YouTube, Instagram, Facebook, etc. to market them and stimulate interest in the buyer's mind. Content marketing is an organic methodology of sales growth.

5) **Email Marketing:** It is a type of marketing in which emails are sent to target users with a view to advertising a product / service. This is an inexpensive method of advertising a product / service. However, users often ignore such emails as spam and might even block such emails. Email marketing is more of shooting in the dark. It is a strategy which is generally used to augment or support other digital marketing strategies. Email marketing is an inorganic methodology of sales growth.

6) **Mobile Marketing:** This is a generic and wider form of marketing goods / services through an electronic medium such as a mobile phone using channels such as SMS, Email, MMS, etc. Like email marketing, such messages could also be treated as spam by prospective customers, and hence, its success ratio could be very low. This digital marketing strategy hinges on the "volume concept". When you send a marketing SMS to say 10,000 people, the 100 or 200 who end up opening and reading the SMS translate into the target audience. If a handful out of them get hooked to the product / service, the intended result has been achieved. This again, is an inorganic methodology of sales growth.

7) **Marketing Analytics:** It is the act of studying sales trends through statistics & collated data of the past, and then, marketing through the most correct and efficient medium that so emerges in the analysis. This is a highly productive method of digital marketing; but it does entail a lot of data analysis and devoting of quality time. This is an organic methodology of sales growth.

8) **Affiliate Marketing:** In this type of digital marketing, marketing is done by paying commission

/ click based fee to external websites for sales generated through their website traffic. In simple words, it means organized marketing of one's product / service on somebody else's website. Affiliate marketing is an overlap to digital marketing methods like Pay-per-click, e-mail marketing, content marketing, etc. This again, is an inorganic methodology of sales growth.

### SIGNIFICANCE OF DIGITAL MARKETING IN TODAY'S DAY AND AGE:

Digital marketing is of utmost importance in today's screen-driven era. According to available statistics, an average person spends upto 7 hours every day on his / her electronic gadgets. This includes messaging, social media browsing, listening to music, reading news, viewing factual video content, so on and so forth. These statistics reflect that almost everybody is online today. Hence, to grow a company / brand, digital marketing is the obvious way forward.

Digital marketing not only helps in increasing sales, it also helps in building brands. Further, it increases footfalls on the website. Accordingly, digital marketing is not only about



increasing sales. It rather helps in the holistic growth of the brand and product / service along with increase in sales. Digital marketing also lays the footprint for long term growth and expansion of the brand / enterprise. When an enterprise digitally markets its products, many users on the internet get access to the advertisement. Google Ads and brand awareness campaigns can help the brand to be recognized among consumers at large, and this helps in boosting sales not only in the short run, but also in the long run. Further, digital marketing helps the business owner to digitally track activities of the consumer after the advertisement link has been clicked. This helps the business owner to figure out the type of advertisements which are more effective and are resulting in better sales. Further, tracking consumer preference pattern and behavior also gives the business owner a sense of how well his / her product / service is being received in the market place and the possible improvements which could be brought about in them.

Digital marketing not only helps businesses who are advertising using it. It is also a means of livelihood for digital marketing consultants and influencers. A new generation of tech savvy digital marketing consultants and influencers have cropped up in the last few years, and they are doing well, thanks to digital marketing.

The simple reality is that digital marketing is the future of marketing. It has drastically changed the landscape of business across the globe, and a lot more is yet to happen in the years to come. Businesses are constantly investing more and more into digital marketing. Most businesses have gradually shifted from traditional marketing methods to digital marketing. Digital marketing as a concept is extremely robust and self-evolving. It has seen a lot of evolution since its start in the 1990s, and a lot more is yet to happen in the times to come.

Businesses have no choice now but to embrace technology and keep pace with its everchanging dynamics. Even small businesses have now realized that they will be rendered redundant and they shall perish soon if they do not keep pace with technology. Digital marketing helps small businesses as much as it helps larger ones. It does not discriminate. It gives every business, brand, product and service the level playing field to grow and prosper. Digital marketing is undoubtedly the way forward and future of marketing across the globe!

### **MY EXPERIMENT:**

As a part of my experiment, I spoke to 4 business owners who are into sale of different types products / services and have different scales of operation. I also circulated a questionnaire related to digital marketing to these 4 business owners and solicited their unbiased responses. A summary of the answers given by these 4 respondents are provided in the 'Result' section of this paper. The questions asked in the questionnaire circulated are as follows:

- 1) What is the nature of the business you are into?
- 2) Do you use digital marketing to promote your business? Yes, or no?
- 3) If you use digital marketing to promote your business, how much do you spend per month on digital marketing?
- 4) How much do you spend on forms of marketing other than digital marketing?
- 5) What forms of digital marketing do you commonly use?
- 6) How do you track your increase in business owing to digital marketing?
- 7) Has digital marketing really helped your business grow, and if yes, by how much percentage?
- 8) Do you use a digital marketing consultant or do you do your digital marketing on your own?



- 9) If you use a digital marketing consultant, how much money do you pay the consultant on a monthly basis?
- 10) Do you have a set plan and budget for digital marketing, or do you carry it out on an ad-hoc basis?
- 11) How long have you been using digital marketing to promote your business, and have the results of digital marketing been consistent, or have they shown a rise or fall over a period of time?
- 12) List down the forms of digital marketing that you prefer the most.
- 13) Which all social media do you use to digitally market your products/services?
- 14) Do you use organic forms of digital marketing such as SEO? If yes, how much do you spend on these organic forms of digital marketing per month?
- 15) Has digital marketing helped you to successfully build your brand over a period of time? If yes, in your view, what is the ideal time for a brand to build using digital marketing?

Following are the respondents to whom the questionnaire was circulated:

- 1) Mrs. Shuchi Ray – Partner at Deloitte Haskins & Sells LLP - An MNC consulting firm
- 2) Mr. Sameer Shetty - Head life coach (India) at Herbalife – A global developer and seller of dietary products and supplements
- 3) CA Surojit Ray – Co-founder of Lusso Fit-out Studio LLP – A startup modular furniture and interior designing enterprise
- 4) Mr. Sudeep Kapoor – Founder of Spice Lab – A chain of restaurants in Gurgaon

I have made my research paper basis the answers received by me from these 4 respondents and the additional research I did on the subject on the internet.

### RESULTS:

- 1) What is the nature of the business you are into? – The 1<sup>st</sup> respondent is an MNC consulting firm (Deloitte). The 2<sup>nd</sup> respondent is into manufacture and sale of dietary supplements. The 3<sup>rd</sup> respondent is an interior designing and contracting firm. The 4<sup>th</sup> respondent is a chain of restaurants in Gurgaon.
- 2) Do you use digital marketing to promote your business? Yes, or no? – All the 4 respondents have replied that they use digital marketing in some form or the other. It is a must in today's technology-driven era.
- 3) If you use digital marketing to promote your business, how much do you spend per month on digital marketing? – The 1<sup>st</sup> respondent replied that Deloitte expends approximately Rs.8-10 lakhs per month in digital marketing. The 2<sup>nd</sup> respondent replied that Herbalife spends almost Rs.20-25 lakhs per month in digital marketing. The 3<sup>rd</sup> respondent replied that approximately Rs.75,000 per month is invested for digital marketing. The 4<sup>th</sup> respondent replied that Rs.30,000 per month is invested in digital marketing. This clearly shows that as the scale of production changes, so does the amount of money invested in digital marketing.
- 4) How much do you spend on forms of marketing other than digital marketing? – All respondents barring the 1<sup>st</sup> and 2<sup>nd</sup> respondent replied that their firm's marketing is done only through digital means and they do not use any other medium of marketing. The 1<sup>st</sup> respondent said that their firm spends approximately 75% of the total marketing fund allocation a month on digital marketing and the rest on other forms of marketing. The 2<sup>nd</sup> respondent replied that their





firm spends approximately 40% of their total marketing fund allocation a month on forms of marketing other than digital marketing.

5) What forms of digital marketing do you commonly use? – The 1<sup>st</sup> respondent replied that their firm uses SEO and social media platforms like Facebook, LinkedIn, Instagram, Twitter, etc. The 2<sup>nd</sup> respondent replied that their firm uses SEO, social media platforms like Facebook, LinkedIn, Instagram, Twitter and paid ads on YouTube Ads, LinkedIn Ads and Google Ads. The 3<sup>rd</sup> respondent replied that their firm uses social media platforms like Facebook, LinkedIn, Instagram, Twitter, etc. and paid ads on Facebook Ads, LinkedIn Ads and Google Ads for marketing goods and services. The 4<sup>th</sup> respondent replied the same as the 3<sup>rd</sup> respondent.

6) How do you track your increase in business owing to digital marketing? – The 1<sup>st</sup> respondent replied that they do not specifically measure increase in business owing to digital marketing. The 2<sup>nd</sup> respondent replied that their sales conversions are direct and can be easily tracked to the specific marketing source. The 3<sup>rd</sup> respondent and the 4<sup>th</sup> respondent reverted exactly as the 2<sup>nd</sup> respondent.

7) Has digital marketing really helped your business grow, and if yes, by how much percentage? – All 4 respondents replied in affirmative. The 1<sup>st</sup> and 2<sup>nd</sup> respondents observed a 15–20% increase in sales and profits per annum owing to digital marketing. The 3<sup>rd</sup> and 4<sup>th</sup> respondents observed a 40-50% increase in sales and profits per annum owing to digital marketing.

8) Do you use a digital marketing consultant or do you do your digital marketing on your own? – The 1<sup>st</sup>, 2<sup>nd</sup> and 4<sup>th</sup> respondents replied that digital marketing is done for their firms with the help of professional consultants. The 3<sup>rd</sup> respondent replied that digital marketing for their is done in-house and they do not seek professional help in this regard.

9) If you use a digital marketing consultant, how much money do you pay the consultant on a monthly basis? – The 1<sup>st</sup> respondent replied that they pay Rs.3,00,000 a month to their consultants for helping the firm to digitally market their services. The 2<sup>nd</sup> respondent replied that they pay Rs. 2,50,000 a month to their consultant for helping the firm to digitally market their products. The 4<sup>th</sup> respondent replied that they pay Rs. 12,000 a month to their consultant for helping the firm to digitally market their products.

10) Do you have a set plan and budget for digital marketing, or do you do it on an ad-hoc basis? – All the 4 respondents replied that they carry out digital marketing based on a set plan and fixed monthly budget.

11) How long have you been using digital marketing to promote your business, and have the results of digital marketing been consistent, or have they shown a rise or fall over a period of time? – All four respondents have been using digital marketing for over 5 years now. All 4 respondents replied that they have observed a very significant and consistent rise in their sales and profits over the years, thanks to digital marketing.

12) List down the forms of digital marketing that you prefer the most – Respondent 1 prefers social media marketing and SEO. Respondent 2 prefers SEO, paid Youtube Ads and Facebook Ads. Respondent 3 prefers paid Google Ads, Facebook Ads and social media marketing. Respondent 4 prefers paid Facebook Ads and Google Ads.

13) Which all social media do you use to digitally market your products / services? – All 4 firms make use of social media platforms Instagram, Facebook, Twitter and LinkedIn.

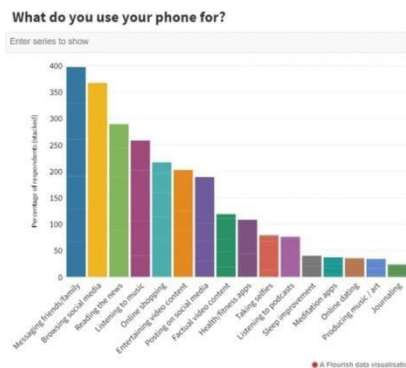
14) Do you use organic forms of digital marketing such as SEO? If yes, how much do you spend on these organic forms of digital marketing per month? – The 1<sup>st</sup> and 2<sup>nd</sup> respondents

replied that their firms do use search engine optimization and some other organic techniques of digital marketing. The other 2 respondents replied that they usually prefer inorganic methods for digital marketing.

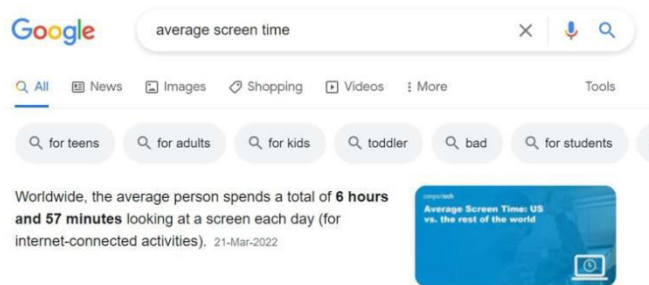
15) Has digital marketing helped you to successfully build your brand over a period of time? If yes, in your view, what is the ideal time for a brand to build using digital marketing? – All 4 respondents replied that digital marketing has greatly helped in building their brands. The 4 respondents replied that brand building through digital marketing could take anywhere between 1 to 3 years depending on the industry and the fund outlay for digital marketing.

### SUPPORTING ANNEXURE:

#### DISTRIBUTION OF ACTIVITIES DONE BY PEOPLE ON THEIR ELECTRONIC GADGETS



#### AVERAGE SCREEN TIME OF A GLOBAL CITIZEN



### CONCLUSION:

Businesses are constantly investing more and more into digital marketing. Most businesses have gradually shifted from traditional marketing methods to digital marketing. Digital marketing as a concept is extremely robust and self-evolving. It has seen a lot of evolution since its start in the 1990s, and a lot more is yet to happen in the times to come.

Businesses have no choice now but to embrace technology and keep pace with its everchanging dynamics. Even small businesses have now realized that they will be rendered redundant and they shall perish soon if they do keep pace with technology. Digital marketing helps small businesses as much as it helps larger ones. It does not discriminate. It gives every business,



brand, product and service the level playing field to grow and prosper. Digital marketing is undoubtedly the way forward and future of marketing across the globe!

### ACKNOWLEDGEMENTS:

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### DIGITAL MARKETING: ANYTIME, ANYWHERE

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#### Abstract

Marketing is undergoing a transformation due to digitalization. Technological advancements are bringing about an increase in digital marketing, social media marketing, and search engine marketing. Because digital marketing is primarily based on the internet, it has benefited the most from the rapid increase in internet users. Digital marketing is becoming more prevalent as consumers' buying behaviors change. This review will assess the role of digital marketing in both the marketing and consumer industries. This paper begins by introducing the concept of digital marketing, and then describes the range of mediums through which digital marketing can be used, and how it can be utilized in small and large-scale industries.

**Keywords:** digital marketing, internet, small-scale, large scale.

**Full Forms:** SME- Small and Medium-sized enterprises.

B2B- Business-to-Business

SEO- Search Engine Optimization

#### Introduction

The term digital marketing stands by its name of advertising on various platforms on the web via multiple forms of communication. Digital marketing, also directed as online marketing, is executed on websites, cell phones, and the internet. It helps in expanding the business by promoting the product on social media. Diverse marketing tactics are carried out by sending brochures, emails, advertisements, and more to promote the product at its full capability. The right way of marketing online will lead to the flourishing of the product if the strings are pulled correctly by fulfilling the purpose, the aimed audience, and the remaining requirements of marketing efficiently.

#### Theory

The way you use digital marketing to achieve success is crucial. The correct usage of platforms is essential. The world staying hands with the internet makes it easier with the indulging of all age groups and interests.

#### The following methods are how and where is the marketing executed.

1. Search engine marketing - Search engines like Google, Firefox, and Yandex are web tools that help users find the information needed on the world wide web. Search engines help advertise the product by displaying or suggesting top searches and more.

2. Emails - Email advertising is widely used by brands. The customer receives promotional messages about the product by the brand. With around 4 billion daily email users, advertising products becomes easier with a big crowd. 64% of small-scale industries have taken upon to promote via emails.
3. Social Media - Applications like Instagram and Facebook help amazingly to promote products. Advertising tools as ads manager have an advantage of both small and large-scale industries paying them similar amounts for promotion helping whether them being small or big.
4. Affiliate Marketing - It is the chain to make a profit.



### Use of digital marketing in small scale industry:

A small-scale industry could skyrocket its sales with digital marketing. In 2020, nearly a quarter of these small-scale industries will be using digital marketing. Physical promotion was no longer possible due to the pandemic; digital marketing was a cheaper and safer alternative. Due to their limited financial resources and inexperience, SMEs have an easier time using digital marketing. Having a range of resources available makes using digital marketing more cost-effective for them. New businesses are typically less complicated as their goals are smaller and can be achieved over several weeks. It is important to have a rigid marketing plan. Since different platforms cater to specific age groups, it would be easy to target the ideal customer age. Word spreads fast online, allowing SMEs to make a powerful impact on the crowd. As mentioned above, social media tools have an agreeable range of prices for impactful impressions. The more they pay, the more the app promotes its ads. As digital marketing suffices the financial needs, the SMEs have a bonus to advance the publicity rate. Email marketing helps SMEs make personal awareness amongst the customers. For SMEs entering the business competition, digital marketing helps them reach out in better ways. The pandemic caused the loss of employment in cities for local and industrial jobs, causing the society to force itself to stay in action to survive. The pandemic had brought us way ahead in the digital world than before. The incoming of new applications and the upgrading of social media are helping us to make ourselves a part of it.

### Use of digital marketing in large scale industry:

Small-scale industries are more likely to use digital marketing than large-scale industries. Large-scale industries are already well off; advertising on these platforms allows them to grow. By using digital marketing, industries can broadcast their new products and promote them more effectively. In addition to advertisements, emails, online posters, and much more, the products gain more screen time so that they become well known to the audience. Large-scale industries have a name in the industry, so they know better about their goals and performance. Therefore, they start offering discounts and sales to attract more customers. A simple poster or banner is usually enough to get their attention. By producing and providing meaningful content, inbound marketers earn the attention of customers and drive them to a company website, unlike traditional



marketing methods. Rather than irritating visitors with interruptions, inbound advertising invites them in because it is relevant and appears in the right place at the right time. Account-Based Marketing (ABM) is a B2B strategy that uses highly customized campaigns to target a specific group of accounts. Various advantages of the approach include quicker sales, cost-effectiveness, and an improved use of marketing resources. Users who visited your site but left prior to making a purchase or conversion are retargeted using browser cookies. This type of marketing is effective as it continually exposes your brand to customers who have already expressed interest in your product or service.

### **Benefits of Digital Marketing:**

Competition is something that makes you want to keep getting better. In such a talented industry, digital marketing has its own bunch of advantages.

#### 1. Cost-Effective

Traditional media marketing is more expensive, but this method is less costly, and the costs can be amortized over time to provide a better return on investment later on. Managing it effectively ensures that an organization is in control of where and how their money is spent.

#### 2. Game Changer

Your web presence can become an instant hit with digital marketing. By utilizing digital platforms, you are able to gain an advantage over those without. Setting your target and really nailing it makes it the right shot.

#### 3. Brand Awareness

For brand awareness, it is not obligatory to rent hefty billboards or advertise in print media. Digital marketing platforms make it easier for you to control everything over one click. The variety of platforms makes it even better. You can make your ad reach any corner of the globe with using the platforms. When it comes to business growth, digital marketing gives you complete control over your image. Customers love doing business with businesses they trust. Digital marketing makes public relations easier than ever before.

#### 4. The win-win situation

Digital marketing helps advertise on online platforms without the use of basic pen and paper. We save a lot of papers from being printed with ad designs; it is completely sustainability. With the help of digital marketing, we get to explore how wide the web is. The space we created for all the information. The space where you get to put in your inputs.

### **Conclusion**

As a leading industry for business establishment online, digital marketing can benefit everyone in many ways. Digital marketing provides small-scale industries with a way to increase impact and establish their business. The large-scale industries, on the other hand, utilize marketing in order to expand, grow, and spread their roots internationally.

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Gupta<sup>7</sup> · Roy Setsiawan<sup>8</sup> · V. Subramaniaswamy<sup>9</sup> · Sudhakar Sengan<sup>10</sup>  
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### TRENDS ASSOCIATED WITH STRENGTH OF KNOWLEDGE ECONOMY CORRELATING TO GROWTH

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#### **Abstract**

The paper aims to analyze the link, if one exists, between the strength of the knowledge economy, that uses the Global Knowledge Index as the identifying index, and the growth rate of an economy. It indirectly evaluates the function and importance of having a healthy knowledge economy system in the country, and how it can be leveraged to grow.

The working hypothesis used for the basis of this paper is that there must be a positive correlation between economic growth rates and the knowledge economy's strength. Despite the knowledge economy having existed as a term and concept for over 50 years, the quantification of the Knowledge economy has been recent, and the links between the metrics have yet to be explored in detail. The paper discusses the data aspect of these metrics, the links, as well as the possible reasons for the trends existing.

**Keywords:** *GKI (Global Knowledge Index), HumanCapital, Production Efficiency, Emerging Economies, Economic Welfare*

#### **INTRODUCTION**

The knowledge economy is the most crucial and critical part in analyzing human capital in a country, and therefore the potential of any nation in the 21st century. First coined by Peter Drucker in 1966, the knowledge economy looks at the use of knowledge to maximize economic welfare. It can be used to look at the effects of advancement in understanding, technology, and research in a country on the economic system. Measuring the knowledge economy is of extreme importance when the increasing reliance on intellectual capital by countries to grow economically in the last decade is scrutinized.

A challenge for social science has been to find metrics to gauge the extent to which society has become more dependent on knowledge production (Powell & Snellman, 2004). The scope of this paper to a large degree is to do just this: to measure how knowledge empowers a country and affects economic growth.

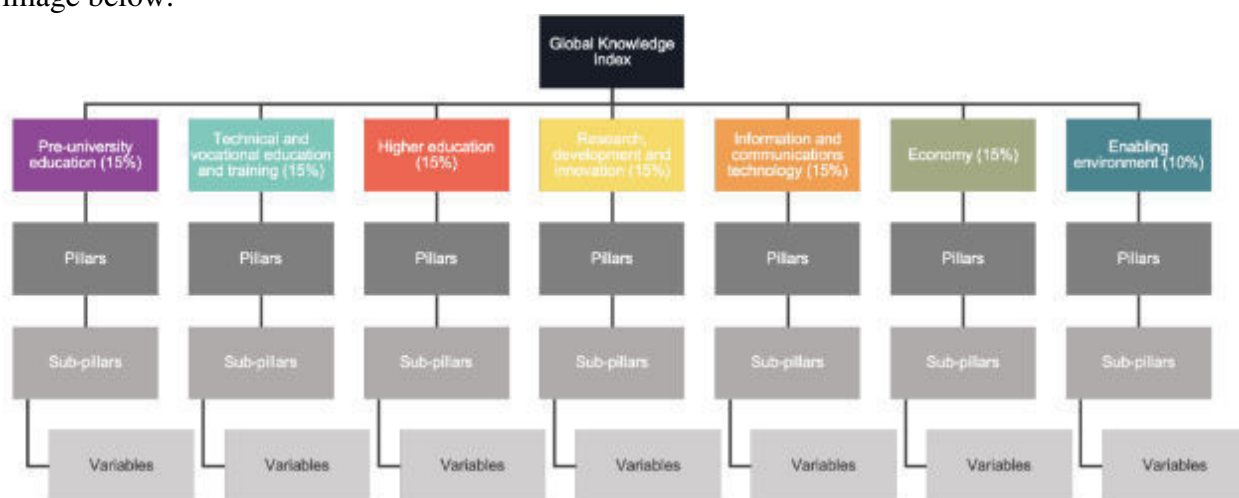
#### **Theory**

Economic growth aims to measure how much better off an economy is now, compared with the past and aims to measure the change in the value for a country's goods and services over a set period. Various indices can be utilized in measuring the economic growth of a country, dependent on the importance and weightage placed on a particular metric or factor, however, changes in GDP and GNP are generally universally accepted as measures of the annual economic growth of a country. GDP per capita is used throughout this paper to measure the growth of an economy due to the ability to being able to place value on the output that is given by every



individual person on average in the country (comparing the knowledge distribution across a country at the same time). This is balanced for inflation and measured in the current values of USD to give a more complete analysis.

While economic growth can be measured in monetary aspects, embodying the knowledge economy of a nation numerically is a larger and more complex task. Quantifying something that is a qualitative factor is extremely difficult, since knowledge is subjective. However, there is an index that measured the strength of knowledge economies of countries based on a variety of different existing factors, which is the Global Knowledge Index. It standardizes the strength of knowledge economies and has various domains to help understand the performance of an economy's knowledge economy. The seven main factors that constitute the GKI are shown in the image below.



**Fig. 1** Pillars and GKI Calculation Methodology (Source: UNDP)

Originally, the GKI was developed as a replacement for the Knowledge Index and has been updated annually starting from 2017. The GKI values used through this paper reflect on the 2020 values for each country as a basis for comparison. Some countries may have a seemingly strong knowledge economies (especially those in the Asian Tiger and emerging economies categories) but may not score as high on the GKI, mainly because they may not be strong in all the pillars used in the measurement of the GKI.

HDI is also used as a secondary index in this paper to measure the strength of the knowledge economy due to the importance of the human capital's strength which reflects the knowledge in an economy. The capability of the HDI to encapsulate the strength of a knowledge economy can be proven by the fact that knowledge is a dimension used to calculate the HDI. The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living (UNDP, 2022).

This paper works on the hypothesis that a positive correlation and trend must exist in the knowledge economy's strength and the GDP- with the assumption that when a country gets better at applying knowledge to benefit the economy, they will likely be able to maximize the economic efficiency of a country and slowly grow the value of the goods and services it produces over time.



The process followed by this paper makes use of linking and categorizing countries into three main different sections based on their knowledge economy strengths:

1. Bottom 5 (B5) Countries: These countries score the lowest in the GKI ranking and have generally weak knowledge economies.
2. Mid 5 (M5) Countries: These countries are in the 71-75 ranking of the GKI and generally score average to slightly below average GKIs. While they are relatively strong knowledge economies compared to the B5 group, they do not score as high as the top performers in the GKI.
3. Top 5 (T5) Countries: These are those that top the GKI rankings. They have high scores, ranging in the early 70s to the late 60s.

These different sections are analyzed separately after a general trend is established to determine a specific link in economic growth rates and knowledge economy positions, and how different amounts of knowledge can lead to differing trends in the GDP per capita. Each segment will be used to provide a general trend and collectively used in the end to compare how it stands against the original hypothesis at the start of the paper.

For static trend generation, 14 different countries have been considered from different positions on the GKI. The table below lists the countries, and the key metrics used for analysis.

**Table 1** UNDP and World Bank data used to build chart

Country	GKI	HDI	GDP per capita
Switzerland	73.6	0.955	87100.4
US	71.1	0.926	63206.5
Germany	66.2	0.947	46252.7
Norway	66.1	0.957	67329.7
Ireland	66.1	0.955	85422.5
UAE	66.1	0.890	36284.6
New Zealand	63.2	0.931	41441.5
China	57.4	0.761	10434.8
Latvia	55.1	0.866	17736.5
Mexico	47.5	0.779	8329.3
Brazil	45.4	0.765	6796.8
India	44.4	0.645	1927.7
Algeria	37.5	0.748	3306.9
Nepal	36.2	0.602	1155.1

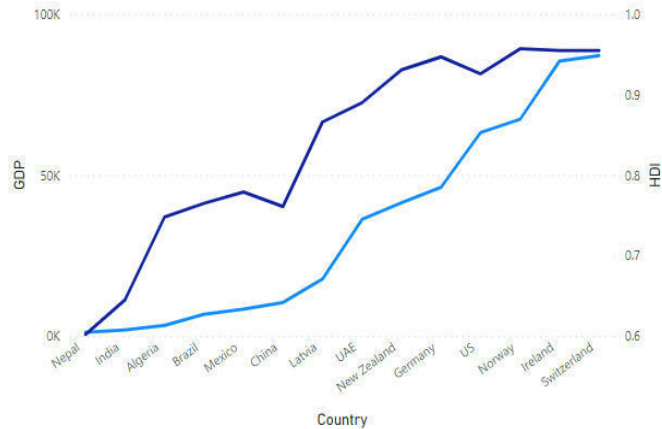
### DISCUSSION

As shown above, there is a positive trend that links GKI and HDI. This matches the expected relationship as knowledge is a part of the HDI trend and analyses human capital as a whole, which in itself has a direct link with training and R&D, which increases the net knowledge of an economy. This means the two can be used interchangeably to cross-reference any pattern generated from any one metric.

At any given point in time, using static measures, a positive link also exists in the GKI and GDP of countries. However, this does not signify a link in economic growth in itself, despite showing a higher living standard in countries with a high GKI. The graph below analyzes the 14 countries



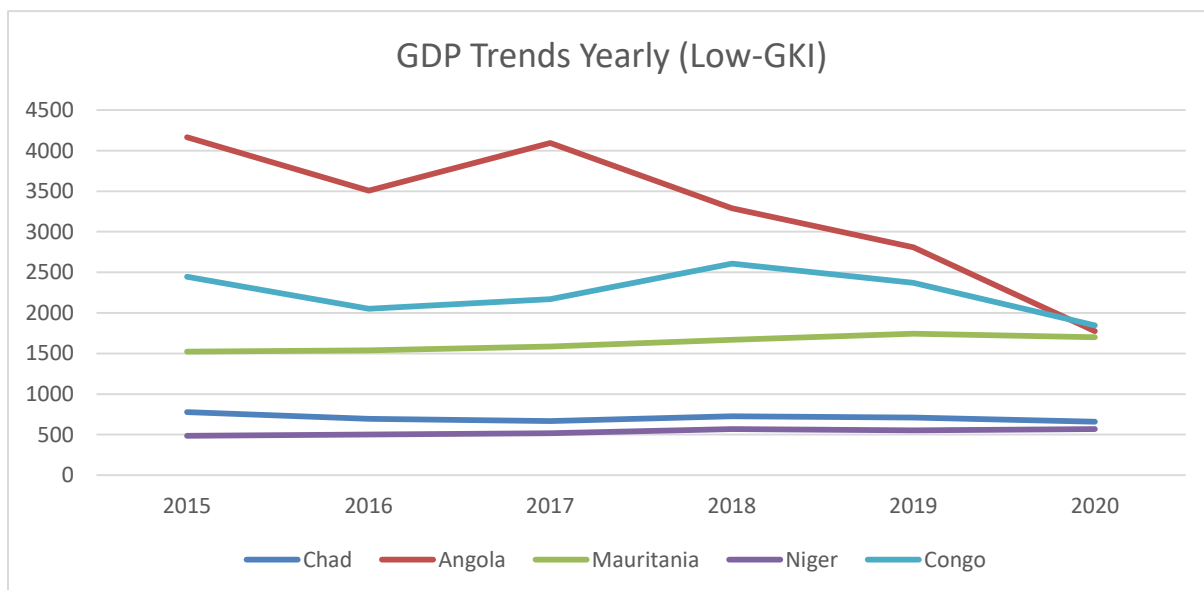
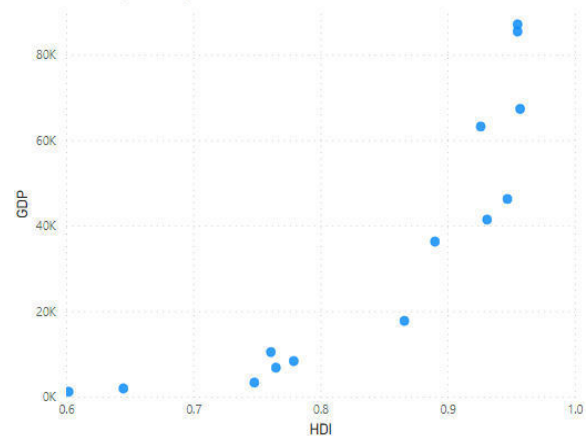
chosen to strongly support a positive quadratic interconnection between the GKI and GDP of a country. This trend is not a chance occurrence- the same relation is obtained even when HDI is charted against GDP. **Fig.4** Line graph showcasing general trend and link in HDI and GDP



**Fig.5** Scatter Graph trend charted GDP by HDI

While the trend of GDP and knowledge in a static model is now established, the knowledge categories and the economic growth rate will now be analyzed to test the hypothesis of the original link. The procedure followed in this paper analyses the B5, T5 and M5 categorical relationships to do this over a 5-year period. This has been taken to be from 2015 to 2020, owing to the recency of the values of the GKI used.

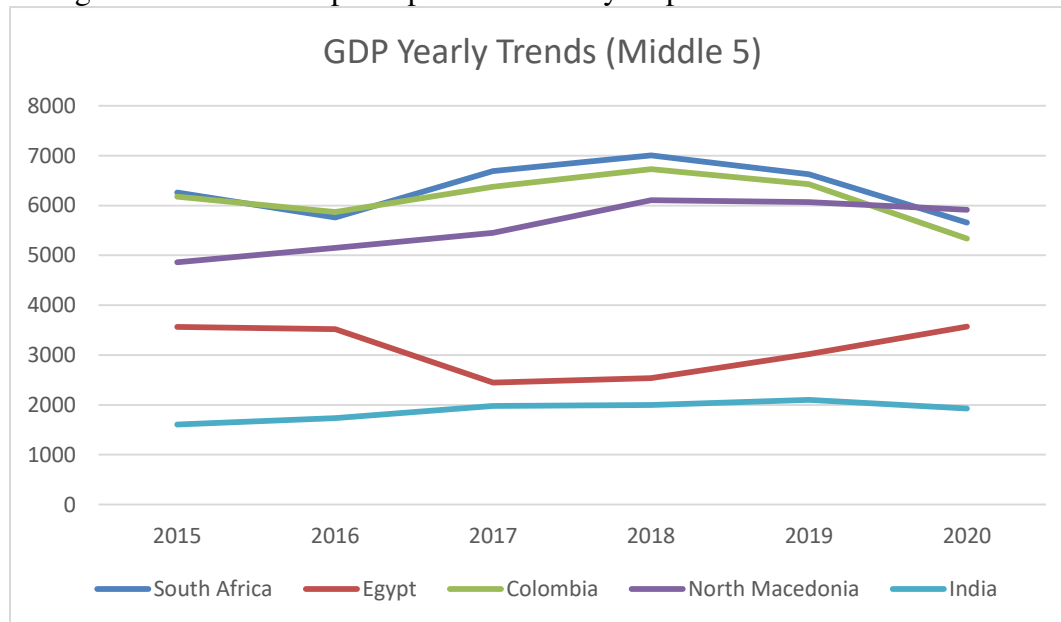
The B5 countries, when graphed, showed a negative correlation to economic growth over time. The general trend was one reflecting fall in GDP per year, with an approximate fall by 13.6% per year. This corresponds to the initial hypothesis, that when one group of countries is low in the knowledge segment, they will generally adopt less efficient production methods, leading to losses in the long run. However, not all countries have experienced a fall in the GDP. Two countries have managed to maintain a small standard rise in





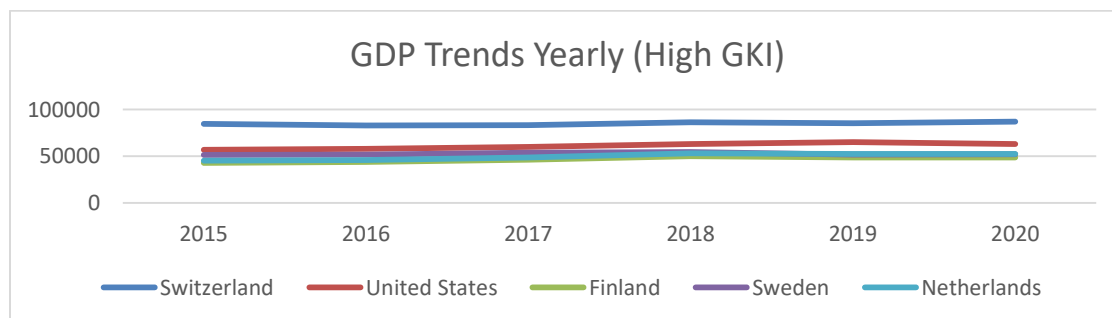
the GDP per capita, which goes on to demonstrate that knowledge in an economy is not the sole factor effecting economic growth rate.

It is also likely that both the countries-Mauritia and Niger-have significantly low GDP per capita in monetary terms to most countries investigated, which shows a scope for rise in GDP per capita to match the others with even lower GKI values, along with HDI over 0.5 in contrast to the rest, which all fall under the 0.5 benchmark. This may reflect a rising GKI in future forecasts (due to a well-trained population with adequate knowledge) and may act as the basis to justify the slight average increase in GDP per capita over the 5-year period.



The countries in the middle of the area show no predictable relationships via analysis over five years, as seen above. There is an average change by a 3.73% rise in the midsection data relating to GDP, which stands to show that even small amounts of knowledge can lead to considerable growth rates. Middle-level knowledge economies, even those under the 50% mark, are still able to be successful, especially if they can ensure stability and invest into growing the knowledge economy sectors.

The top segment of the knowledge economy is the one showing the strongest link between the knowledge economy and GDP per capita growth rates.





The top segment shows a rise in the GDP per capita rates over time, with an extremely slight fall being recorded only in 2019-20, when the impact of the Covid-19 pandemic. Nevertheless, even with the fall, the 5-year analysis for the high GKI countries reveals that on average, the countries have risen in GDP per capita by 9% on average. This is an immensely significant contrast to the low and middle GKI ranked countries and may be grounds for suggesting a parabolic relation between the growth rates too (in addition to the already established static relation between monetary values of GDP per capita and GKI values).

### Conclusion

The aim of this paper was to analyze the relation between the knowledge economy of a country, and the effect it has on the growth rates of a country. As expected, the graphs produced do suggest that the initial hypothesis generated was correct in terms of the positive relation between GKI and economic growth rates of a country. While the knowledge economy isn't the sole factor affecting the GDP per capita increase over time, it is certainly an aspect that holds value in predicting the trend of a country's economic condition. When countries experience a rise in their GKI, it is likely that the predicted outcome of a rise in GDP per capita be true. Logically, this is backed by the fact that the more knowledge you have, the better the work you can produce in terms of quality and efficiency.

Identification of other such important factors which have a link to economic growth is a crucial area of study for economists, especially to ensure the growth of an economy stays at an optimal level, which can lead to better performance of national economies, helping to increase the pace of development in emerging economies by helping them understand the focus points based on their rankings.

The strong trend that a high GKI has with economic growth suggests that having a strong knowledge economy is a sure way to increase the growth rate of an economy. If countries invest in strengthening the knowledge-based economy based on the pillar of the knowledge economy in which they see potential for growth, they may be able to grow their GDP per capita exponentially in the interest of the citizens.

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### ROLE OF MILITARY COMMUNICATION IN EMPOWERING DEFENSE

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#### Abstract

The research emphasizes the evaluation of the methods of communication, the evaluation in mediums which were used to communicate and are linked with the technological development in the military defense field , also focuses on cost efficiency and seamless , secure performance of the mediums used to communicate . It is a link between military communication and the defense system and also study of the potential opportunity cost which are harmful over benefits. Also the influence on macroeconomic aims to determine what will happen whether the communication system and defense system balance or unbalance.

**Keywords** :- Macroeconomic aims - The main government aims for the economy:- Economic growth , Low unemployment , Price stability , Balance of payments stability , Redistribution of income, Wearable technology - Electronic device to be worn on the users body which is portable compared to substitutes, Vital - essential , necessary which is to be transferred

#### Introduction

The smell of the gunpowder that drifts above the battlefield , the description of one side, post any war the reason is communication problems – being not secure ,not seamless and clear , time taking or not possible in difficult situations ,the drag till this situation must have a cause -not updating or not evaluating to changes in technology which is result of innovation and development, government spending unnecessary rather on defense this has also a consequence of loss in political and economical position of a country .

#### Theory

Military Communication System is integrated with up to date changes in technology to deliver flawless, fast and secure and cost efficient and productive communication systems.

Defense system refers to the country's ability to defend and attack or react to others, the one with the most ability is said to be the most potential and strong defense system.

Seamless and smooth working of this leads to increase in political and economical standings of the country. It globally emphasizes a country and the possibility of it dominating, advising, acknowledging and means a lot.

Clear and concise amount of information has been always backbone to all successful military operations . In the pre-industrial periods there were commandos themselves who made surveys so the time efficiency and accuracy couldn't be achieved .In the early 20's ,evaluations and adjustment according to growth in research and development, effective communication became even more necessary and vital . In the modern era , there is the use of combined

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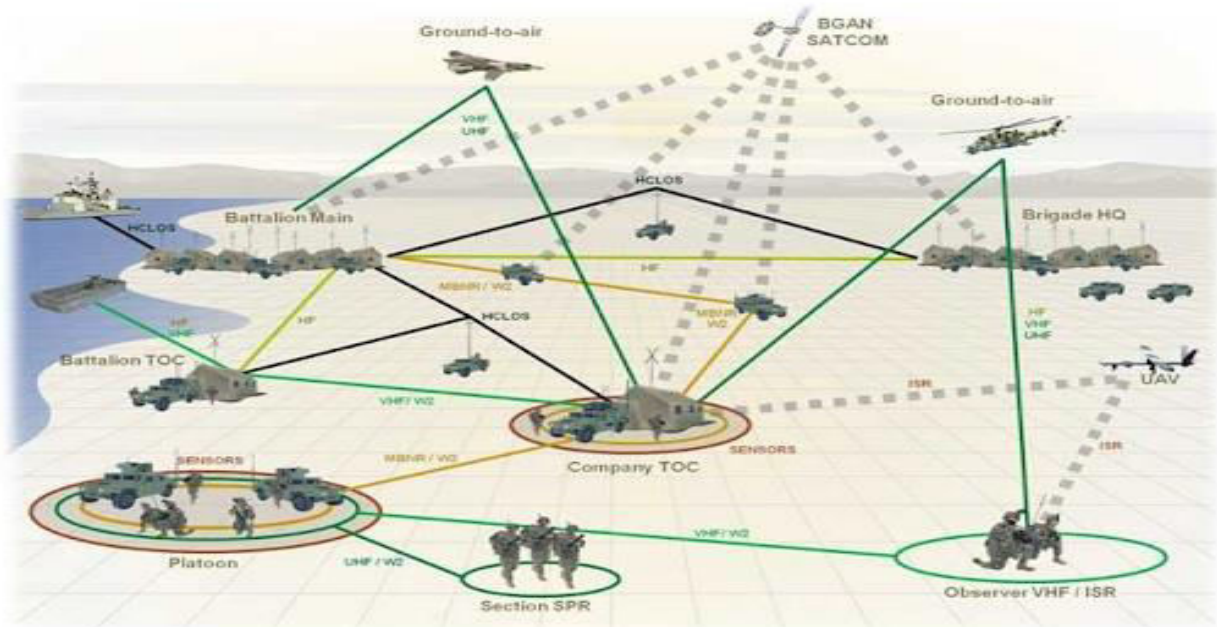
operations where there were shared data services which created a network in all organizations who played a role in the defense system of a country .

As time is passing, equipment which can survive the toughest situations in the war are being developed and the infantry are provided with a broad spectrum of communication technology. All of this centralizes in wearable technology, these are combinations of vision ,data and voice . But the challenge arises, that the connectors should be made taking in consideration that they have that potential to resist shocks and vibrations. Also the SET { Severe Environment Testing } program has designed and successfully made connectors that meet the willingness and ability of the military with the latest information technology .

### Result

Military communication which is up to date and has no issues in working can lead to faster transmission which will be easy for the military to give reflexive actions to the oppositions and centralized communication can help all coordinate and work accordingly all together . Also use of wearable technologies provides portability. And a planned architecture of communication is really important on the battlefield. Also the use of communication media which survives harsh conditions in the battlefield is the most suggested.

### Harris Battlefield Communications Architecture



### Discussion

This is an example of military communication where it is centralized by a drone in the air. This is where effective and seamless performance is achieved and safe and secure data transmission is occurred.





### Conclusion

To get effective , safe , secure and seamless performance in data transmission while any war the technology used should be never outdated it should be in touch with advances in technology also the ways to use it must be taught and regular drills for practice should be performed so that reflexive action is faster . All the communication media must be in proper status and safe and secure transmission is must for that the adjustments should be made prior and all coordinating together will bring great results .

### Acknowledgements

This was an astonishing experience and a status where such an event I participated means a lot . I would like to express my gratitude to Sanjay Ghodawat International School for giving me this opportunity where I got a platform to present my work . I achieved great and in-depth learning on my topic . This is also a way of learning which lets us go out of the book and the current affairs are revised .

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### WEARABLE SENSORS IN HEALTHCARE: RELIABLE ENOUGH?

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#### Abstract

Wearable biosensors in healthcare have made a dynamic transformation in the way technology and healthcare are integrated at the consumer level. Their non-invasive, continuous, and dynamic methodology of measuring parameters has piqued the interest of researchers and the community equivocally. Biochemical markers such as sweat, tears, saliva, and intestinal fluid are measured to derive health statistics and status. Their use in diabetes, cardiac disorders, strokes, and menstrual disorders to myriad fitness aspects has been witnessed in the past decade. This research paper aims towards identifying the reliability of sensors in healthcare as mentioned earlier in monitoring scenarios and to find feasible solutions to improve the standard of healthcare facilities using remote health monitoring (RHM) and the Internet of medical things (IoMT).

**Keywords:-** Activity tracker Smartwatches Diabetes Stroke Cardiac issues Asthma Fitness Internet of Medical things Remote health monitoring Sensors

#### 1. Introduction

As the world is moving into the digital age, the Internet of things is becoming increasingly used and valuable. In parallel, the general population is augmenting their focus on health, fitness, and wellness. Fitness trackers such as FitBits, Apple Watches, Samsung sensors, and many more have skyrocketed their sales in the last few years as users gush over the fancy new features being added. The charts below illustrate the expanding market fuelled by increasing user base due to health awareness and multiple beneficial features being included in the trackers. The global wearable technology market size is expected to reach USD 118.16 billion by 2028, registering a CAGR of 13.8% from 2021 to 2028 as shown in figure 1b.

The advent of the pandemic catapulted the adoption of remote healthcare and technology. Research by agencies such as IQVIA, McKinsey, and a few others indicates that the adoption curve has been accelerated by at least a decade. This has impacted not only the practice methodology of Health care professionals (HCPs) but also the consulting-seeking behaviour of the general populace. Nearly 77% of the HCPs use remote / tech-enabled tools for patient consulting. Focus on health and wellness has been paramount pre, peri, and post-pandemic and has brought focus on the critical health parameters.

The other major aspect is data centricity with both collection and management facilitated by IoMT. The IoMT is mainly used to collect the remote data for patient through wearable sensors/devices and store them in the cloud databases. There are three main stages in this data management: device layer (body sensor network (BSN)) Fog layer and cloud service as shown in



The main challenge for widespread usage of all types of sensors in the healthcare industry is the reliability and accuracy of the data collected by them. Errors in this data can impact the remote management of patients and can prove fatal. This research paper hence measures the reliability of some of the most prevalent sensors in the healthcare industry and also understand if some of these devices are capable of foreshadowing certain illnesses.

### Theory and Experimentation

Wearable sensors do not only have the sole purpose of monitoring activity for the user. The public health relevance of such wearable devices is increasing and may impact areas, such as physical activity, well-being, cardiovascular health, mortality risk, dietary habits, among others. For example, higher volumes of physical activity energy expenditure measured by wearable devices was recently shown to be associated with reduced mortality rates, and that higher-intensity activity reduced mortality rates to a larger extent than lower-intensity activity (Strain et al. 2020). Recent advances in technology have resulted in a myriad of wrist-based sensors being built into the current generation of fitness watches. These include digital 3-axis accelerometers, pulse oximeters, optical heart rate sensors, thermometers, barometers, and magnetometers, among others. These sensors, in combination with ever-improving algorithms—most of them proprietary—have led to fitness companies marketing these devices as being capable of estimating and monitoring such physiological parameters as step count, heart rate (HR), sleep quality, sleep rhythm, energy expenditure (EE), maximal oxygen consumption ( $\dot{V}O_{2max}$ ), peripheral oxygen saturation, and the “training effect” of both individual and cumulative exercise bouts.

The data from these devices also enable doctors to carry out quicker diagnostics, so in order for them to make an informed decision, they need the data to be reliable and accurate. Various trials have been conducted for different disorders using patients to assess the reliability and dependability of data from wearable tech. Research-grade wearable technologies include the Actigraph GT3X+ and ActivPAL.

This is not only necessary for certain terminal or immediate response treatments but also for the general improvement of physical and mental well-being of patients. All of these possibilities are only available when the data can be trusted. Even people susceptible to cardiac illnesses, or diabetes or strokes will also benefit as certain discourse markers in levels of biological markers can help foreshadow the aforementioned diseases.

Post Stroke : A review published in *Journal of NeuroEngineering and Rehabilitation* by Denise M Peters et al, emphasised that emerging wearable technologies can provide new opportunities to enhance assessment and rehabilitation post-stroke. Wearable devices allow the capturing of mobility and physical activity performance in different free-living settings, and clinical access to this data can potentially assist with earlier identification of functional decline and improve the timeliness of referrals, reassessment, and treatment. 13 articles were published in peer-reviewed journals; 6 were randomized control trials (RCTs)

,5 were cross-sectional studies 1 was a non-randomized control trial and 1 was a longitudinal pilot study. The mean sample size of the study was 23 participants. As anticipated, there is little consistency in the choice of device used to collect and analyze people’s gait and mobility post-stroke. The most commonly used wearable technologies were triaxial accelerometers of varied brands with fewer studies using pressure sensors for gait assessment These studies conducted



reliability and validity analysis of one or more of the following outcome measures: gait speed, step counts, and/or swing symmetry, which were compared against a criterion standard that included one of the following: 3D gait analysis, clinical outcome measures of gait and mobility, or video-based counts. Stroke/ Post trauma : Devices like SpineX fall in between the wearable tech and medical devices paradigm by helping post trauma paraplegic patients to walk again. These are wearable tech / sensors that build the new realm of possibilities in science.

Cardiac: Experiment by Priyanka Kakria, N.K. Tripathi, Peenapong Kitipawang reports that - “A real-time health monitoring system for remote cardiac patients using smartphone and wearable sensors”, was designed to find out which sensors measure cardiac activity the best and also a questionnaire was designed to check the pulse and oxygen levels of 40 participants using wearable sensors and handheld android device.

Additionally, a trial by Giles et al (2016) measured heart rate and heart rate variability in the trial participants. Heart rate with wearable sensors depends on multiple confounding factors such as stress, hormones, sleep, body temperature, skin pigmentation, sweat, metabolism, etc. These impact the PPG-based sensors and can produce different readings of Heart rate variability. As per Shaffer and Ginsberg (2017), the heart rate can also change with age, sex, health, and baseline heart rate itself. Hence baseline monitoring and algorithms to predict the outcomes are essential for accuracy. A study by Graham et al, studied 77 participants in an ongoing study with wearable devices and found that the devices were useful in the early detection of physical decline

**Diabetes:** A publication by Rodriguez et al (2021), reviewed 26 publications that focused on the use of wearable sensors in monitoring diabetes and related parameters. A total of 30 different sensors were used across these studies, with a maximum sample size of 100 participants per study. Their recommendations find potential in the use of wearable tech for diabetes management.

**Fitness/ step tracking /distance covered and energy expended:** Wearable tech is routinely used by fitness enthusiasts and athletes to measure parameters related to fitness and health. There are multitudes of studies measuring these parameters and have been the focus of wearable tech companies to associate the correlation between fitness and health. A study by Fuller (2020) examined 158 publications, 9 different wearable brands, and 45 devices for measuring step count and found that certain measures had reliability and validity. Many other researchers also found that some earlier shortcomings of the measurement of steps were mitigated by the manufacturers.

### Ongoing studies

**Asthma:** Apple and Anthem, along with the University of California, Irvine, and software company CareEvolution, are launching a two-year, 900-participant study. The study is investigating how devices like Apple watch and iPhone can support patients to control their asthma and hospitalization

### Results and Discussion

Various trials have clearly demonstrated that wearable tech has a definite place in health care management and monitoring. Trials quoted above have shown that wearable technology has impacted the prevention, improved predictability, and become a strong input in the assessment of patients. Some parameters and measurements are more reliable and validated particularly in



more controlled environments. However, with dynamic environments, and variety in manufacturer models and algorithms, the validity and reliability is dynamic.

In heart rate variability, cardiac conditions, step count, and fall prediction once the baseline has been established, data from the wearable sensors have been found to be useful and helpful in the prevention of the unfavourable impact of the health abnormality. The impact of the environment on the variability and reliability of sensors is known. As well as inter-individual variation makes the performance of the devices challenging.

The algorithms used for the wearable sensors are proprietary and therefore the measurements, their interpretation of metrics also impact the validity. Systematic reviews have shown that some algorithms perform well at the population level, however estimation at individual level is still large

### Discussion

Wearable technology and sensors are here to stay and be an integral part of healthcare management. They have advanced rapidly over the past decade or so. The validity and reliability of the sensors has been of interest to manufacturers and end users.

The validity and reliability of wearable technology is still not an established concept. Inter brand variability and reliability differences in conditions elucidated above mandates the standardisation of measurements and interpretation of the data obtained from the wearablesensors.

### Conclusion

Even though, the devices have relatively high accuracy (98%), they still need improvement to successfully predict illnesses such as diabetes, stroke and cardiac illnesses. In the IoMT era, remote healthcare monitoring represents the future of the healthcare industry. Importantly, in order to improve people's quality of life, vital signs of humans' body such as glucose level can be monitored. Global cases of certain illnesses are certainly increasing and wearable sensors posts to be the future of the industry. Not only it helps patients to identify and improve certain aspects of their lives but also helps doctors to make more informed and healthier diagnoses for both the doctor and the patient. Recommendation to conduct a phase 3 trial validating the efficacy of wearable devices will probably bring some standardisation and improve the reliability and validity. Wearable technology is going to be an integral part of our life and is going to be the tool to measure variety of metrics. Individuals will need assistance in interpreting this data, sharing it with their physicians, finding its use in prevention and meaningful prevention of serious diseases. Hence standards for wearable devices akin to medical devices need to be introduced. Validity and reliability can also improve if the data is collected over a longitudinal period of time rather than a point in time thereby indicating trends and variances in the same. Additionally, if devices are capable of more individualised capabilities their usage, reliability and validity will be further well accepted. It's time for science and technology to work towards ushering in the new era in wearable technology.



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[Ren-Jay Shei](#), [Ian G. Holder](#), [Alicia S. Oumsang](#), [Brittni A. Paris](#) & [Hunter L. Paris](#) Wearable activity trackers—advanced technology or advanced marketing?

Reliability and Validity of Commercially Available Wearable Devices for Measuring Steps, Energy Expenditure, and Heart Rate: Systematic Review

### RELIABILITY OF WEARABLE SENSORS IN HEALTH CARE MONITORING

**Bhumi Shah**

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#### Abstract

The main agenda of *wearable sensors* is to achieve home monitoring of people who are subject to chronic conditions, especially older adults. Currently, talking about walking with the trend, wearable technology in healthcare includes electronic devices that consumers can wear throughout the day, like fit bits or smart watches and keep monitoring themselves over a period of time. They help keeping a track of Enhance continuous glucose monitoring, measuring glucose levels in tears, improve patient safety and Internet of Medical Things (IoMT) and wireless sensor based system to capture daily activity at home. These sensors are widely used for patients in rehab to monitor them continuously and check their progress. This research paper focuses on how the upcoming devices of *wearable sensors* and their technologies are much more appealing than the older ones, along with how *wearable sensors* to monitor health are overall better and thus superior over the non-wearable ones.

These devices collect the personal data of healthcare and their exercises. A brief idea about these recent developments in the field of *wearable sensors* and systems that are relevant to the field of rehabilitation is explained in this research paper. To enhance the clinical development of *wearable sensors* and systems for the future, a followed up survey was personally carried out on a Google form and the results helped me reach those conclusions.

**Keywords:** Wearable sensors and systems, biosensors, Telemedicine

#### INTRODUCTION

Over the years, the need for *wearable sensors* was just a so called “want” for some people, but recently especially after Covid-19 spark and the pandemic hitting us like a huge iceberg, it has almost become a necessity. It has necessitated a planned approach to alleviate the battle with substandard lab infrastructure and a lack of adequate equipment. With improved disease surveillance, any country can handle health emergencies more efficiently with the help of *Telemedicine*.

Smart wearables are consumer-grade, connected electronic devices that can be worn on the body as an accessory or embedded into clothing. These include smart watches, rings and wristbands, to name a few, and they all have high processing power and numerous sophisticated sensors that can glean new health insights.



Combining wearable device technology with smartphone, self-testing can be improved and real time monitoring of various parameters such as temperature, oxygen levels and pulse rate, reducing burden on healthcare and creating a vigilant environment. This helps us to reduce the death rates, as it automatically indicates the health care ministry in case of an emergency with almost being very reliable with average delay of approximately 14s and low power consumption with estimated standing time of nearly 4 hr.



### THEORY

*Wearable sensors* have weaved their way into the world. This includes electronic devices, that could be worn or so called accessorized by patients, designed to relatively collect one's data, and may even notify or alert a doctor or other healthcare expert in real time by sharing the user's health information.

Piloted by the hyped up demand of one to monitor their own health and keep track of their own vital signs has drastically shifted up the demands of wearable technology, making it not to double but to triple in the last four years, along with it to be projected to jump in the upcoming years.

Individuals may use the gadget to continually check their health without needing to contact a doctor or other health care provider. Wireless connectivity, such as that provided by an Internet Protocol Television (IPTV) set-top box, enables measurements to be taken and analyzed by a 'computerized' healthcare service provider. Measurements are forwarded to a service over the Internet for a more accurate assessment. Based on the features, the gadget talks with services in order to diagnose the individual.

- **Smart health watches**

The FitBit Flex was an early and popular wearable technology choice. Users were drawn to it because of its elegant appearance and ability to track their step progress throughout the day using the device's five indication lights.

Smartwatches, which were formerly solely used to count steps and indicate time, have now evolved into clinically effective healthcare instruments. In 2017, Apple released the Apple Heart Study app, which monitors users' heart rhythms and alerts them if they are having atrial fibrillation. In 2021, the business introduced the most recent Watch iteration. Apple's Series 7 model has a blood oxygen saturation monitor, native sleep tracking, a quicker FDA-approved





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electrocardiogram (ECG) sensor, improved heart health monitoring, and fall detection, which will instantly contact 911 if the wearer is not moving.

- **Wearable ECG monitors**

These are at the bleeding edge of consumer electronics, and their capacity to measure electrocardiograms, or ECGs, distinguishes them from some smartwatches. The Move ECG can do electrocardiogram measurements and email the results to the user's doctor, as well as identify atrial fibrillation. It can also track pace, distance, and elevation, as well as walking, running, swimming, and bicycling automatically.

- **Biosensors**

*Biosensors* are emerging wearable medical gadgets that differ significantly from wrist trackers and smartwatches. The Philip's wearable biosensor is a self-adhesive patch that allows patients to move while collecting data on their mobility, heart rate, respiration rate, and temperature.

According to Augusta University Medical Center research, this wearable gadget reduced patient progression into avoidable cardiac or respiratory arrest by 89%. This highlights wearable's capacity to enhance patient outcomes while potentially reducing staff effort.

### Experimental

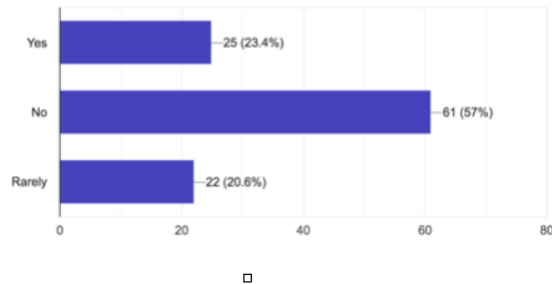
- On carrying out a survey personally, it was found that more than 80% of the people including all genders and generations preferred wearing a smart watch over any other *wearable device* such as chest strap monitors and ECG patches. All age groups were taken into consideration with their options kept in mind.
- After carrying out the survey, one issue popped up with the fact that people are yet not more comfortable with *telemedicine*, creating an urge to make that side of remote healthcare



monitoring to be explored more and make it much more appealing to the people, catering to all different types of age groups and gender to be specific. It needs to be made more handy and improvised in such a way that it can be easy to everyone.



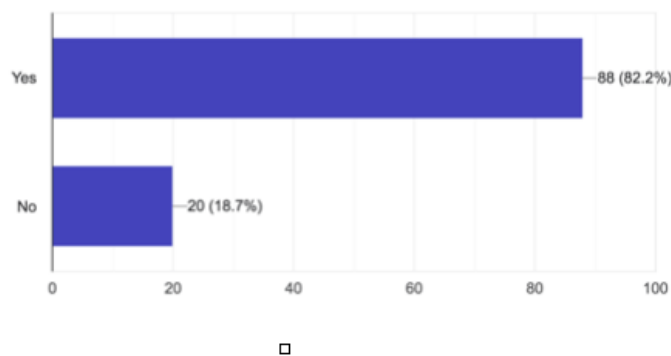
Telemedicine can be defined as the use of technology (computers, video, phone, messaging) by a medical professional to diagnose and treat patients in a remote lo...  
107 responses



### RESULT

To sum it up, it was found out that people prefer using wearable sensors, to remotely track themselves, and within the wide range of wearable sensors, smart watches, fit bits and wristbands are highly recommended and chose over the chest straps and ECG monitor patches. On carrying out a personal survey, it was clearly evident, that more than 80% of the people recommend others onto using wearable sensors. Statistically it was proven that people preferred to wear and use wearable sensors.

Do you recommend others on using wearable sensors?  
107 responses

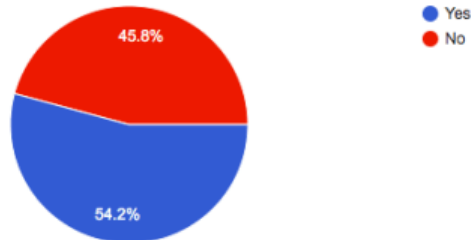


### DISCUSSION

On carrying out a survey personally to find out more about peoples' views, knowing about *wearable sensors* and telemedicine, it was found out that people of various age groups know about *wearable sensors* and how they preferred *wearable sensors* to monitor healthcare over the non-wearable ones. Furthermore, it was to be found out that more than 50% of the populations with mixed age groups wear a smart watch along with using it to track their health. Not only that but most of them rely on the results provided by smart watches to track their health.

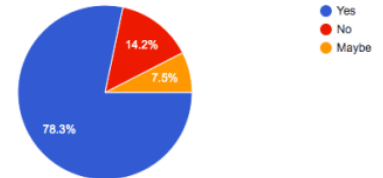
Do you wear a smartwatch?

107 responses



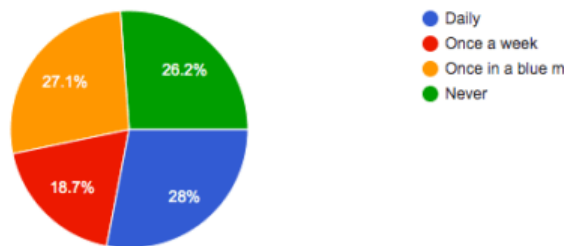
Do you know what wearable sensors are?(View at the start to get a jist of it)

106 responses



How often do you use it to track your daily fitness, blood pressure and oxygen?

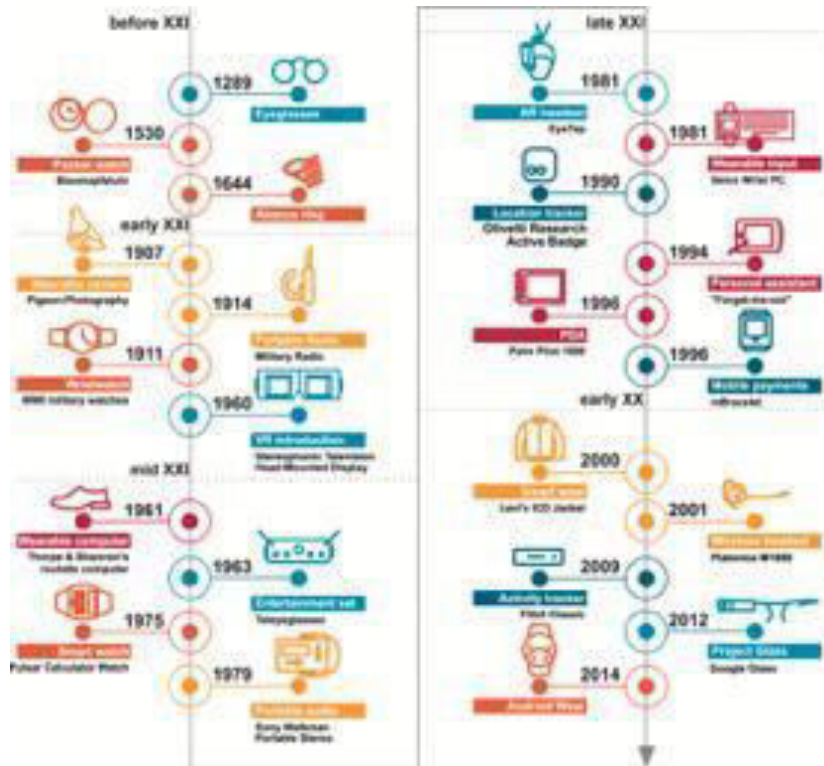
107 responses



### • JOURNEY OF WEARABLE SENSORS

Over the times, wearables too have had a glow up!!

Today's wearables are mostly regarded as smart-by-definition gadgets. People often forget that "smartness" hasn't always meant processing data on a chip, but rather providing a better user experience. From the century until 2015, the following subsections provide an outline of wearable's development. For convenience of understanding, the progression is visually illustrated in the Fig.



Wearables began with the introduction of eyeglasses in the nineteenth century. Later came the first pocket mechanical watch, which could be carried around, originates from the early the century, which were then considerably developed with the progress of miniaturization, which led to the notion of strapping the device to the wrist in the century. At that time, the improvements were mostly driven by military requirements. The next important milestone in the development of wearable technology comes after World War II's recovery.

Pushed through the race of technology, the later years may be defined as a boom in personal activity monitors. The most sophisticated gadget at the time, Basis, distinguished itself from other fitness devices by gathering data such as heart rate, calorie intake by exercise, numerous sleep phases, and perspiration and skin temperature using Body IQ technology. The market was confronted with several initiatives, and the number of individuals wearing those skyrocketed in only a few years.

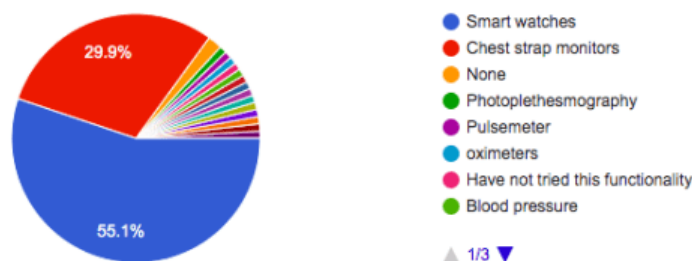
### • COMPARING

*Wearable sensors* have been updated and improvised as time passed, being much more advanced with the launch of technologies such as smart watches and fit bits which are not only more reliable but also more preferred than the regular *wearable sensors* like Chest-strap monitors and ECG patches due to it comfortable and stylish look with enhanced features that allows patients to do much more things rather than just monitoring themselves. This is clearly evident from the survey taken upon.



Do you prefer smartwatches or chest strap monitors to measure your heart rate?

107 responses



*Wearable system* health monitoring applications commonly make use of a number of sensors, which are typically integrated into a sensor network that is either limited to body-worn sensors or includes both body-worn and ambient sensors. In the early days of body-worn sensor networks (also known as "body sensor networks"), the integration of *wearable sensors* was accomplished by threading "wires" through pockets built in clothing for this purpose. This technique is shown via the MITHril system.

Consequently as much as they are accurate, it is just not as feasible as the smart watches, which do not have multiple wires hanging through and make it much more easier for the patient to remotely track themselves along with a doctor's overview. Even though for working out, chest strap monitors are still the most precise, but heart rate monitor watches (and smart watches) are becoming fantastic possibilities.

Remote healthcare monitoring (RHM) based on IoT can make a healthcare easier and more efficient in terms of cost, accessibility, visibility, reliability, accuracy, affordability, continuity, and real time monitoring. For example, hospitalized patients cost a lot of money to the patients, healthcare facilities, and insurance companies. Furthermore, patients residing in distant places may not have easy access to hospitals and caregiver centers. As a result, individuals must travel considerable distances to get health treatment. IoT in RHM has the capacity to improve healthcare services through interoperability, communication and information sharing, and data transmission.

On the flip side, Significantly, the change toward sophisticated technologies, such as Augmented Reality (AR)/Virtual Reality(VR)/Mixed Reality(MR)/Extended Reality (XR) devices, low-end wearables and other monitoring devices, as well as a transition to Beyond Fifth Generation (beyond-5G) mobile networks, would provide a number of issues for device suppliers, network operators, and end-users. These difficulties are related to the paradigm shift from traditional Human-to-Human (H2H) connections to more Machine-to-Machine (MTC) interactions. This segment has radically different requirements than the H2H segment, such as completely different traffic patterns, higher reliability, lower latency, more mobile scenarios, strict security and privacy requirements, and higher energy-efficiency expectations.



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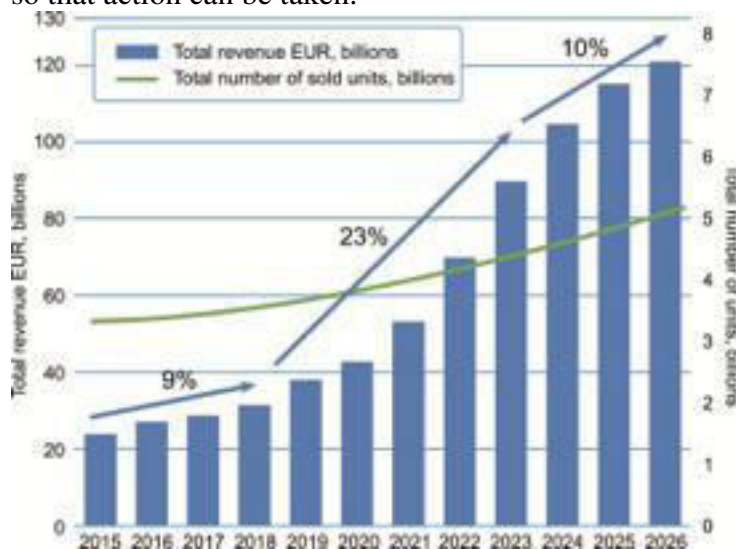
At the same time, applications on phones not only enables low-power ECG sensors to communicate wirelessly with the phone but also apps with watches being connected to it, helps tracking and storing of records. Smart phones, with their expanding computing and storage capability and ubiquitous connection, are projected to genuinely enable continuous health monitoring.

All of the aforementioned factors result in an increase in power consumption and the need to recharge wearable/handheld gadgets on a daily basis, lowering their appeal and restricting their wearable applicability. Modern technology, such as energy harvesting and wireless charging, may help to alleviate the energy shortage, but the influence on the user's health has yet to be well investigated. Moreover, energy-harvesting technologies are still a long way from widespread implementation.

Even with smart watches being more costly ranging up to \$40 to \$400, it still counts for its worth.

### CONCLUSION

From the standpoint of the users, the rise of the mobile device market delivers new and usable devices, multiple perks, and new apps. Wearable technology encourages proactive solutions for healthcare, fitness, ageing, disability, education, transit, enterprise, money, entrance systems, gaming, music, and a variety of other issues. Let us start with a healthcare example because wearables, as we know them today, were originally intended to be strictly medical gadgets. Unfortunately, people tend to react to potential health issues in a reactionary manner, such as scheduling a visit to their doctor when they are unwell or in pain. By continuously tracking one's health, a wearable gadget may be able to predict disease and even automatically notify a doctor so that action can be taken.

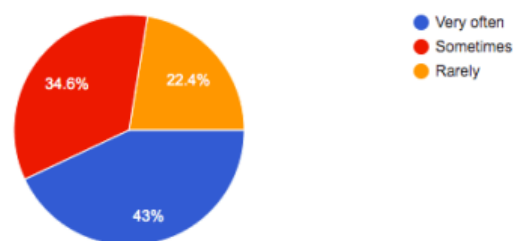




Even after the spark of covid 19, people used wearable sensors to measure various aspects such as blood pressure, temperature etc, as in such times of crisis, it wasn't feasible for everyone to step out of the house and this seemed the best way possible, and once again it proves the fact that wearable sensors help in remotely monitoring patients

During covid-19 how often did you use wearable sensors like thermometer, oximeter etc

107 responses



### Acknowledgements

As quoted in an article named 'Flexible, Stretchable Sensors for Wearable Health Monitoring: Sensing Mechanisms, Materials, Fabrication Strategies and Features' by several authors namely Yan Liu, Hai Wang and many more, several immersing breakthroughs, evolution in material science, nanotechnology and fabrication techniques have been happening and are in process to happen. All these are focused for better signal delivery and power supply to simplify the sensor system in wearable technology.

Also I personally created a survey to know more about wearable sensors and view of people with varied age groups, to understand their thinking and preferences on the same-  
<https://forms.gle/Uw11XeoVUzT3MdB9>  
(all the summaries of responses are mentioned along the research paper in form of pie charts)

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### DESIGNING AN AIRBORNE VEHICLE COMMUNICATION SYSTEM FOR TRAFFIC SURVEILLANCE- AN OVERVIEW

**Madhav Kabre**  
Anisha Global school

#### Abstract

This paper analyses airborne vehicle communication systems from a design perspective looking at the practicality and possibilities of such a system. This research is important to give insights into whether such a system is viable or not. The research has found that an airborne vehicle communication system for traffic surveillance is in fact not very viable as a replacement for traffic surveillance but rather can be used as an accompaniment to other systems.

**Keywords:-** Design need: a problem which needs to be solved, UAV: Unmanned Aerial Vehicles, TMC: Traffic Management Centres

#### Introduction

At a brief glance an airborne vehicle communication system for vehicle surveillance seems to be a perfect solution to the problem of traffic surveillance. Basic design theory is necessary to understand some parts of this paper. The objective paper is to deep dive into communication systems and to evaluate them from a design perspective.

#### Theory

When looking at a certain object it is important to ascertain 8 things: the aesthetics, cost, customer, ergonomics, safety, security, function, and manufacture of a certain product. A well-designed product will have good properties of each area. For the aesthetics of an Airborne Vehicle Communication System for Traffic Surveillance, it is important that it not be visible to the normal person when it is operational. This is because there is a chance that some people may find it unnerving and may feel unsafe with such things around. But it is also important that the drone be visible to air space controllers and planes flying at low altitudes. There is an altitude restriction in place to avoid any collision but then the problem of effectiveness arises. Since the maximum height for small UAV's is so low the effectiveness of such a system would be greatly compromised in metropolitan areas and therefore it would only be functional in a very small number of places.

The cost to run drones is also not cheap at all, if they are to be run all day since tis drone will be surveying traffic it will need a very good camera and must be very fuel efficient. Most UAV's according to their manufacture most commercially available drones can only fly for about 25 minutes. And that is just not long enough for such a system. Since TMC's require nonstop surveillance the drones would have to be switched around periodically (every 15-20 minutes) which would drive the cost exponentially higher both for initial investment and for maintenance.





Drones are very fragile and can get damaged very easily, if an animal like a bird was to collide with such a system, It could prove to be hazardous to the drone. The maximum impact momentum commercial drones can take is around  $1\text{kgm}^2\text{s}^{-2}$ , which is very low. It also isn't possible to utilize larger UAV's in urban areas because of the lack of maneuverability and the fact that they need other infrastructure like runways to get into the air. This would mean that unmanned surveillance would be next to impossible.

However, such drones would be very functional; they would be incredibly easy to manoeuvre and would have no blind spots provided they are in the right location. This would be a huge advantage to security personnel and other staff on the ground. It would also be able to cover a very large area. But operation would be heavily affected by the climate, if the weather gets too windy or rainy the airborne system would not be able to cope or keep stable considering its relatively light mass.

Though such a system may not be viable to take the place off an already in-built infrastructure it is useful as an accompaniment to already in place infrastructures. It has a very quick response time and incredibly good maneuverability. It can send more data as compared to conventional systems and it doesn't require a driver. Using algorithms these systems can navigate themselves. There is also a large variety of vehicles available to use. For the city quadcopters can be used as they can lift off vertically and are incredibly manoeuvrable. For more plain and flat areas one can use UAVs as they are fast and can travel long distances without needing to worry about fuel.

research by Students and faculty at The State University Of New Jersey shows that many states in America like Florida have employed Such airborne vehicles to help them. They are mainly used to help the police, coastguard, fire department and other important facilities. Not only is this much more functional than using them in place of normal traffic surveillance systems, but it is also more cost effective, it also will not be necessary to manufacture such a large amount of drones.

In conclusion an airborne surveillance system isn't viable to replace traffic systems for many reasons such as fragility maintenance and function, but it is viable as an accompanying system to the main system. This allows for better costs, safety, and security. Also, and airborne vehicle communication system for traffic surveillance has an extremely fast deploying time is extremely versatile when used in support for already established systems.

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### FORENSIC ACCOUNTING AND ITS USEFULNESS TO PREVENT AND UNEARTH GLOBAL CORRUPTION

Geetarath Rajiv Arora

Sanjay Ghodawat International School

#### Abstract

The concept of prevention and detection of 'Fraud' dates back to 3300-3500 BC when accountants of Egypt were involved in fraud detection and has existed ever since. This paper attempts to analyze the reasons for the commission of the most common form of occupational fraud – Corruption. Corrupt practices in both the public and private sectors have been on the rise and have fueled inequality leading to a plethora of inefficiencies. Forensic Accounting and fraud detection methods can assist in the prevention and discovery of corruption schemes globally which will be further discussed in the paper.

Keywords: *Forensic Accounting, Fraud Detection, Occupational Fraud, Corruption, Combatting Corruption, Anti-fraud measures.*

#### INTRODUCTION

The hominal species has certain capacities that no other species has. Humans can chuckle and weep; no other species can. Humans are blessed with the capacity to suppose, assess, estimate and innovate. Humans can consider, concentrate, debate and intervene. However, with all these exemplary traits, humans have also evolved into shady and deceptive creatures. Only the mortal species that can think and deceive others with the above-mentioned skills is able of carrying out intellectual and fiscal deception which develops into 'fraud' or white-collar crime. The truth is that 'fraud' always existed, but has advanced and grown exponentially in recent times. As per Sec 17 of the Indian Contract Act 1872, 'Fraud' means and includes any of the following acts committed by a party to a contract, or with his connivance, or by his agent, with intent to deceive another party thereto of his agent, or to induce him to enter into the contract. (1) the suggestion, as a fact, of that which is not true, by one who does not believe it to be true; (2) the active concealment of a fact by one having knowledge or belief of the fact; (3) a promise made without any intention of performing it; (4) any other act fitted to deceive; (5) any such act or omission as the law specially declares to be fraudulent[1]. Fraud is a truly universal problem, affecting organizations and economies worldwide. At the top level, occupational fraud- ie. fraud within an organization can primarily be classified into three categories – Asset Misappropriation, Corruption and Financial Statement Fraud [2]. According to the ACFE Report to the Nations 2022, occupational frauds caused losses of more than \$3.6 billion worldwide[2]. This paper will focus on the median in terms of the frequency of fraud and the monetary losses, ie. Corruption. It includes offences such as bribery, illegal gratuities, economic extortion and conflicts of interest. These offences can either take place at a minuscule level, known as petty corruption, at large-scale involving top government officials, known as grand corruption or involving the entire economic system known as systemic corruption. Measuring the extent of harm and damage

caused by these offences can be difficult due to the existence of concealment and deceptive processes but Forensic Accounting can act as a tool to prevent and unearth global corruption. While there may be several versions of the definitions of Forensic Accounting, the one given by Crumbley, Heitger, and Stevenson Smith in their book *Forensic and Investigative Accounting*, Second Edition, aims to explain the term most effectively. It states that ‘Forensic accounting is the action of identifying, recording, settling, extracting, sorting, reporting, and verifying past financial data or other accounting activities for settling current or prospective legal disputes or using such past financial data for projecting future financial data to settle legal disputes’ [3]. This paper will further focus on how Forensic Accounting will aid in preventing and unearthing corruption.

### THEORY

The Fraud Triangle Theory:

The Fraud Triangle Theory is a fundamental framework developed by Donald R. Cressey that defines and explains the intent of an individual to commit occupational fraud. The triangle consists of three elements that outline the reasons a person may commit fraud or increase the risk of fraud: Opportunity, Incentive/Pressure and Rationalization [5]. The theory states that an individual or an organization has three reasons to construct an intentional deception to avail a personal benefit, whilst harming other parties not involved in the fraud. The first vertex of the triangle refers to the ‘circumstances’ which allow the fraud to occur – Opportunity [5]. In instances where internal controls within an organization/country are not enforced or monitored properly, where there is no segregation of duties and there is a poor ‘tone at the top’- which refers to a lack of honesty, ethics and integrity of the upper management of a country/organization, provide opportunity- ie. favourable circumstances to an individual to commit fraud. The second vertex of the triangle is the incentive to commit fraud. This may refer to the personal monetary or non-monetary benefits gained through the commission of fraud. The third vertex of the fraud triangle is Rationalization. It refers to the possibility of the detection of fraud and the probable justification to commit the fraud, which may relate to personal dissatisfaction or the intent to perform a particular task through fraudulent processes.



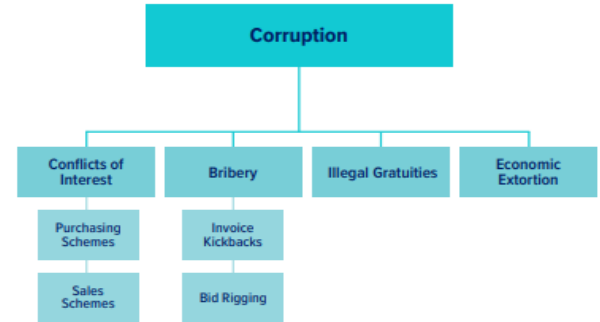
This theory has further evolved into the Fraud Pentagon Theory which states that along with the three elements of the triangle theory, there are two more elements that play a role in the commission and detection of fraud – Competence and Arrogance. The former refers to the individual’s ability to override and go through internal controls, carrying out tasks unlawfully while the latter refers to the ‘attitude of superiority’ among others and the feeling that fraud will not be detected[5].

Corruption as occupational fraud:

The world bank has given a concise definition of corruption as “the abuse of public office for private gain.” While this definition focuses on the public sector, it can also be used to define corruption in the private sector; the term public office may refer to any commercial organization [4]. There is a common misconception that corruption only involves public officials. However, corruption can occur in businesses, governments, courts, media and across all sectors including



healthcare, finance, sports and education. As stated in the introduction, corruption in an organization can be classified into four primary offences which can further be divided into micro-offences. These are Conflicts of Interest, Bribery, Illegal Gratuities and Economic Extortion as shown in the figure. A conflict of interest refers to illicit private gains made by entrusted employees of an organisation whilst adversely affecting the company through Purchasing Schemes, Sales Schemes or any other processes. Though these kinds of schemes are uncommon in government offices, they are fairly familiar to the private commercial sector. The next form of offence is the most common in all sectors of the economy – Bribery. Bribery is the agreement of an individual to offer something of value to an official for doing or failing to do a certain task. This can be done through both cash or kind. A kickback is the most common form of bribery in which an individual receives a ‘kickback’ i.e. compensation for doing a favourable task. Over-billing is an example of a kickback where the vendor sends a deceitful invoice with higher prices, inferior goods or unnecessary goods, with an employee of the organization helping to receive the payment. Bid-rigging is another form of bribery where two or more parties collude with each other to submit a rigged bid in agreement with who will be the winning bidder. The federal trade commission gives out certain forms of bid-rigging where competitors may agree to take turns being the low bidder or sit out of a bidding round or provide intentionally high bids to cover up a bid-rigging scheme.[6]. An illegal gratuity is the same as bribery, however, the only difference is that the payment or gift is made after an official does or fails to do a certain task. Economic extortion is the other side of bribery or illegal gratuities where the official demands money or other consideration to make a particular decision or to perform/not perform a task, with or without threatening the other party.



### Literature Review

The Association of Certified Fraud Examiners’ Report to the Nations 2022 outlines data from 133 nations covering around 2110 cases which, in total, caused monetary losses of more than \$3.6 Billion [2]. ACFE reports that corruption was the most common scheme in every global region, with southern Asia reporting the highest percentage of corruption schemes.

**Table 1** Percentage of corruption schemes in global regions [2].

Region	% of Corruption Schemes
Asia-Pacific	57
Eastern Europe and western/central Asia	64



Latin America and the Caribbean	59
Middle East and North Africa	59
Southern Asia	71
Sub-Saharan Africa	62
United States and Canada	37
Western Europe	44

These schemes have a median loss per month of \$12,500. This is calculated by dividing the loss amount by the number of months the scheme lasted before detection [2]. The study also reveals that schemes committed by an owner/executive have a velocity nearly three times that of schemes committed by employees and manager-level individuals, which means that cases involving higher officials are likely to cause greater damage in a shorter time period. The main cause of corruption in both the public and the private sector is low pay scales. Lower income of employees and other individuals leads to the employees resorting to corruption for financial benefits. National-level government agencies reported the highest median loss of \$200,000 while state/provincial governments reported a median loss of \$56,000. As of 2013, corruption took up 33% of occupational frauds which has drastically increased to 50% in 2022. Moreover, with the rise in the usage of blockchain technology and cryptocurrency, the opportunity to attempt fraud has increased, also increasing the difficulty to detect and prevent fraud – 48% of kickback payments or bribery were made through cryptocurrency. Creating fraudulent physical documents (39%) was the most used concealment procedure used by perpetrators, with alteration of physical documents (32%) being the second-most used concealment procedure while 12% of cases did not involve any attempts to conceal fraud[2].

### RESULT

The literature review revealed that the occupational fraud of corruption is generally detected through tips from employees and internal audits. This data shows that when fraud is identified proactively, it is caught more promptly and results in fewer losses; on the other hand, passive detection results in longer-lasting schemes and greater financial harm to the victim.

### DISCUSSION

There are several red flags (behavioural characteristics associated with fraud) that can be observed in the individuals involved in corruption schemes. These are when an employee is noticed living beyond their means or there are financial difficulties in the perpetrator's family, abnormally close connection with vendors/buyers (revealing the risk of purchase/sales schemes) or when the behaviour of the suspect is too good to be true- ie. no red flags are observed. 85% of all perpetrators displayed at least one behavioural red flag. Internal and external surprise audits, job rotation of employees and formal fraud risk assessments can be conducted to prevent and detect corruption.



### CONCLUSION

With the increasing rate of corruption schemes around the world, the existence of fraud detection and prevention methods has become of paramount importance. An effective system of detecting and preventing corruption will not only reduce the monetary losses faced by organizations but will also aid to eradicate financial inequality among the population. While the intention to commit fraud can be referred to from the fraud triangle or the fraud pentagon theory, Forensic Accounting and Audit are of utmost relevance and importance in ascertaining the financial losses and identifying the perpetrators of corruption schemes. This paper attempted to shed light on occupational fraud – Corruption, in particular, and the statistics regarding the same. It also aimed to show the available methods to unearth and prevent corrupt practices worldwide.

### Acknowledgements

I would like to thank my father CA. Rajiv Arora for his guidance.

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### AGRARIAN VS KNOWLEDGE: THE FUTURE OF THE WORLD ECONOMY

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#### Abstract

This research paper aims to determine the future of the economy being knowledge or agrarian, by studying past trends in the structural transformation of economies while understanding and acknowledging the importance of the two coexisting for a successful yet sustainable future. It recognizes the need for an agricultural advancement to boost economic growth as well as strengthen the knowledge and agrarian economy. This paper proves the significance of the interdependence between the two, and the power this convergence holds over the future of the economy.

**Keywords:** Knowledge, Agrarian, Structural transformation, Coexisting, Agricultural advancement, Interdependence, Convergence.

#### INTRODUCTION

The correct answer to the future of the economy requires a comprehensive understanding of the two possible types of industries that form a strong base of any economy: Agrarian and Knowledge. As the name suggests, agrarian or agricultural economy is associated with the cultivation of land, mainly raising livestock and growing crops, which is largely found in developing economies. It is rural-based and revolves around the market of agricultural commodities along with being classified as a crucial and major category under the primary sector of industry. Knowledge economy on the other hand is based on innovation, research, development, intangible assets (such as employee knowledge) and education. Advances in technology, scientific research and employee productivity are all a part of the knowledge economy which mainly deals with intellectual capital. Such a type of economy will often be found in developed countries and falls under the tertiary sector of industry.

The problem now arises, when the question is raised as to which economy holds the future in their hands. Without the agrarian economy, the world would cease to exist as food security would be jeopardised globally, thus negatively affecting not only millions of jobs worldwide but also dumping tremendous pressure on the healthcare system. Similarly, in the absence of the knowledge economy, development and economic growth would be restricted everywhere.

This research paper focuses on discussing and creating a different solution as opposed to choosing one, which would prove to be inefficient in the future. This solution would be the confluence between the two economies, agrarian and knowledge, along with their respective connection and dependence on one another to enhance economic growth completely. This paper



will also focus on how various economies in the past have faced problems during their evolution from agrarian to knowledge and how those mistakes can be used as a guide and support further research in this domain, thus preventing them from occurring again.

### Theory

Agrarianism is thought to value rural society as being superior to urban society in every way possible. For example, a hard-working, independent farmer is superior to a paid employee. It emphasises more on the simplicity of rural life as opposed to the diverse complexities of urban life. Subsistence farming is the practice of growing crops and raising livestock, which is sufficient only for the farmer's own use, without any surplus trade. It symbolises and offers independence and self-sufficiency, rather than relying on advanced technology to increase output for additional trade.

The Industrial Revolution marked the dominance of the secondary sector of industry (factory and machinery) over the primary sector of industry (agriculture) and the emergence of new technological, socioeconomic, and cultural features into the economy. It is known to have had both positive and negative effects on the world economy and despite the rise in unemployment and pollution throughout the globe, the Industrial Revolution is said to have increased the standard of living and production of goods worldwide.

### History

Around 12,000 years ago, the very first farmers of this world switched to subsistence farming as opposed to their usual hunting and gathering. This provided an adequate and dependable food source for all. The first agrarian economies of this world adhered to self-sufficiency by producing food on a small-scale level, which was just enough for themselves whilst hardly carrying out any trade. Examples of these could include the planting and harvesting of wheat in the Fertile Crescent of the Middle East, growing of maize (corn) in America or the harvesting of rice in the river valleys of Eastern China. This Agricultural Revolution marked the start of the most basic degree of the agrarian economy in this world.

As years flew by, this agrarian economy did not vary much except for a few miniature trades here and there between neighbours or small villages. Countries such as Mesopotamia, Egypt, and Sudan along with others near the Indus Valley flourished in their agricultural markets, along with gradually learning the varietal use of animals for several purposes such as milk, wool, manure, etc. Around 1500, as the climate was changing drastically, so was the social and economic structure within cities and countries, due to increased food surpluses and population densities which accounted for increased transportation costs and technological limitations restricting global trade worldwide. The need to modernise the agricultural sector became more urgent than before. And then was born the Industrial Revolution, that turned the tables for the agrarian economy and proved to gain another step towards the birth of the knowledge economy.

### RESULT

The term "knowledge economy" was first used sometime in the 1960s. All economies depend on knowledge, for example, even the farmers of agrarian economies need the correct knowledge on how to farm and grow crops. During the Industrial Revolution, the use of this knowledge simply





multiplied in different areas of production and agriculture (due to the manufacturing industries) which eventually led to a discovery of newer technology and innovation that was crucial for further economic growth. Modernization in the agricultural sector included the switch from labour-based agriculture to technology-based agriculture, which helped boost labour productivity (saving time) and ensured efficient allocation of resources since the farmers were well-equipped with the knowledge required to grow the correct crops (according to the market forces of demand and supply) through better education and training.

Thus, the last few decades of the twentieth century saw a rise in technological advances along with research and development which secured a significant growth in the knowledge economy and introduced the world to the concept of globalisation.

### DISCUSSION

Focusing solely on any one economy might not prove to be very fruitful in the long run and is likely to lead to misallocation of limited resources. For instance, focusing solely on the agrarian economy poses a high risk of societal inequality and can also lead to a possible overdependence on land. With the ever-rising population in the world, over dependence on farming, land and agriculture can worsen scarcity and increase the pace with which the resources are depleting. On the other hand, focusing solely on the knowledge economy would not be advisable since agriculture plays a crucial role in any economy as it is the main source of food for any individual. Without nutritious and healthy food, health problems would rise and pose enormous pressure on health care services, not only affecting the individual but also causing a slowdown in the business and production processes, thus reducing GDP, and slowing down economic growth as well. It can also lead to rural to urban migration which would again cause a sharp rise in population, unemployment, and pollution. With the two economies depending on each other, we can expect newer technology being introduced that would modernise the agricultural sector, initiate sustainable development and increase the overall quality of a country's standard of living.

### CONCLUSION

History has been the compilation of different experiments of the world, that initially adjusted to the agrarian economy and then shifted to the knowledge economy. The Agricultural Revolution and the Industrial Revolution have had several positive and negative impacts on the economy through which we can now form a suitable hypothesis as to which economy holds the future in their hands.

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### WEARABLE SENSORS IN HEALTH CARE MONITORING: HOW EFFICIENT ARE THEY AND WHAT IS THEIR SCOPE?

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#### Abstract

This paper aims to check the reliability of emerging wearable healthcare sensors. We do this by comparing the results gained by monitors versus that of sensors claimed to record data such as Blood pressure, heartrate, oxygen meter etc. We also compare to see if famous brands do provide the reliability they claim to provide.

**Keywords:** *Healthcare sensors, Blood pressure, Heartrate, Oxygen meter, Claim.*

#### INTRODUCTION

Tracking health is vital. Technologies have allowed us to do this hassle free in hospitals, clinics and at the comfort at our homes! Tracking health has become a necessity in the lifestyle people have adopted today. As today's lifestyle is based on convenience and speed, healthcare has also had to revolutionize its methodologies in tracking their patients' health. Wearable sensors in healthcare track and monitor a person's health. These devices can be worn directly or indirectly on a person's body. Heart rate, blood pressure, and calories are a few things that they can track. Diseases and illnesses like atrial fibrillation, high blood pressure, respiratory issues, stress, sleep apnea, and even a sedentary lifestyle are also taken account of. We use these trackers in our life in forms of a fitness bands such as the famous apple watch and Fitbit. People also use wearable Electrooculographic (ECG) monitors and Blood Pressure monitors. With the help of cloud computing, our data gets recorded, which is convenient for users equipped by smartphones. The data can be viewed by third-party apps.

The demand of such devices is increasing by the day, as consumers realize the significance of these devices. According to an article by Markets and Markets [1], the **wearable sensors market** was valued at USD 189.4 million in 2015 and is expected to grow to USD 1,654.0 million at a CAGR of 30.14% between 2016 and 2022. With such a rapid growth in this market, it clearly indicates that there has been a booming success in its sales and usage. However, the question that arises here is that, whether despite the increasing sales, can the reliability of these devices be trusted?





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With many emerging brands producing technologies convenient for their users in terms of healthcare sensors and monitoring, is their reliability of the devices being compromised? In this paper, we will highlight the reliability of these wearable devices in healthcare, and test to see if the data being collected by these gadgets is consistent.

### Experimental

In order to test the efficiency of emerging wearable sensors, one of the best ways to do this is by comparing common tracking such as the ECG, heart rate, and Bp monitor to the actual devices.

A research study conducted by National Library of medicine, wanted to investigate the accuracy and precision of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and oxygen saturation (SpO<sub>2</sub>) measurements of 2 novel all-in-one monitoring devices, the BodiMetrics Performance Monitor and the Everlast smartwatch [2]

In the study, they recruited 127 participants that were aged 18 years and older from the Thomas Jefferson University Hospital Preadmission testing Centre. HR and SBP was measured using both the investigative variables, and in addition, the Everlast watch was also utilized to measure DBP, and the BodiMetrics Performance was used to measure the SpO<sub>2</sub>. Four hospital grade standard and three investigational vital sign measurements were taken after 5 minutes of quite sitting, with 60 seconds between each measurement. The results for this were that the accuracy guideline was only met for the HR measurements for both the devices. SBP measurements deviated 16.9 (SD 13.5) mm Hg and 5.3 (SD 4.7) mm Hg from the reference values for the Everlast and BodiMetrics devices, respectively. The mean absolute difference in DBP measurements for the Everlast smartwatch was 8.3 (SD 6.1) mm Hg. The mean absolute difference between BodiMetrics and reference SpO<sub>2</sub> measurements was 3.02%.

### RESULT

According to the result of the study, even though both the devices met the accuracy guideline for HR measurements, they failed to meet the predefined accuracy guidelines for the other vital sign measurements.

### CONCLUSION

Wearable technologies have proven to be accurate in terms of a few vital measurements, however, it cannot yet show full precision in data as compared to a medical equipment found in hospitals.

The reason being, is that different brands and companies are still emerging in terms of technology, funds, research and inventions. Depending on the type of brand selection, the quality of data collected differs the result achieved. Even though The Apple watch was cleared by the Food and Federal Administration (FDA) it still showed accuracy less than 50 [3].

Emerging technology such as wearable devices in healthcare monitoring, are a great tool to help observing a person's health, but it cannot always give in-depth results as those found in a clinical setting. With better resources, the usage of devices as such can prove to be useful to its users. As mentioned above, with the increasing sales in the market, there certainly is a scope for them.



### Acknowledgements

I would like to thank my teacher Ms. Pallavi Kerketta for providing me with this opportunity with this wonderful project. I would like to thank her effort and support into making this possible, and finally I would like to also extend my gratitude to my classmates into helping me.

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## THE RELIABILITY OF WEARABLE SENSORS IN HEALTHCARE MONITORING

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### Abstract

Wearable sensors are attracting abundant interest because of their potential to provide continuous, real-time physiological information through effective, non-invasive measurements of chemical markers. Recent developments focus on electrochemical and optical biosensors, as well as advances in non-invasive monitoring of biomarkers, including metabolites, bacteria, and hormones. A combination of composite biosensors, micro fluidic sampling and transport systems has been integrated, miniaturized and combined with flexible materials for improved portability and ease of use. Accurate and reliable real-time physiological information sensing using wearable biosensor technology will have a wide impact on our daily lives. Hence the question arises how reliable are these day to day wearable sensors ?

**Key words :-** Diabetes, Comparisons, Sensors

### Introduction

Throughout this paper the blood glucose concentration readings are taken by three sensors : sensor 1: glucose BG-03 ( non-wearable), Sensor 2: continuous glucose monitor - Abbott freestyle ( wearable ), Sensor 3: smart watch - Apple series 7 and are studied in depth. The key points being studied are the accuracy , pain level and the availability and costing.

### Theory

The wearable sensors sensor 1: glucose BG-03 ( non-wearable), Sensor 2: continuous glucose monitor - Abbott freestyle ( wearable ) will have inaccurate results in the long run and this may have detrimental effects on an individual.

### Experiment

Difference between the readings of

Sensor 1: glucose BG-03 ( non-wearable)

Sensor 2: continuous glucose monitor - Abbott freestyle ( wearable ) Sensor 3: smart watch - Apple series 7.

Two test subjects: female, age 52 years, and male, age 32 years were given the sensors mentioned above to utilize over the course of three weeks. Their meals were constricted to 3 meals a day as well as a purely vegetarian diet.

The apple watch was worn at all times excluding 10 pm to 8 am, for charging purposes

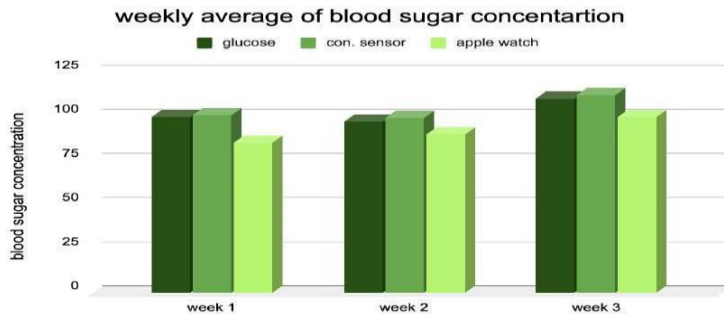
The continuous sensor was worn at all times excluding 10 pm to 8 am for charging purposes

The glucose levels in the blood were checked 3 times a day Morning 8:30 am

Afternoon 2:00 pm Late evening 9:30 pm

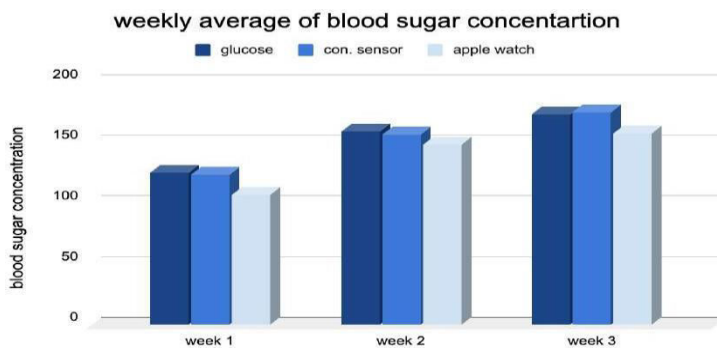
Female age - 52 :

### Results



The average blood sugar concentration reading of the candidate per week was calculated and plotted on a bar chart. With reference to the preceding chart, The average concentrations of the continuous wearable sensors and the non-wearable glucose BG-03 do not significantly differ. The continuous sensors' average differs by 1 to 2 points when compared to sensor 1. The Apple Watch, on the other hand, has significantly lower readings as compared to the other two sensors used in the experiment, differing by a minimum of 9 points and a maximum of 16 points.

Male age- 48



The average blood sugar concentration reading of the candidate per week was calculated and plotted on a bar chart. With reference to the preceding chart, The average concentrations of the continuous wearable sensor and the non-wearable glucose BG-03 did not have much of a significant difference, it reached a maximum of 3 points and a minimum of 1 point. The Apple Watch readings were significantly lower as compared to the other two sensors used in the experiment, differing by a minimum of 6 points and a maximum of 17 points.

#### Pain levels

Sensor 1: glucose BG-03 ( non-wearable)

Although highly accurate and widely used this sensor is intrusive and causes mediocre levels of pain to the user at the moment of being pricked which causes certain users to postpone the usage of this device

Sensor 2: continuous glucose monitor ( wearable )



Sensor 2 is non-intrusive and pain free but can often be tagged as irritable as it has to be worn all day. Some users complain of rashes and redness caused by the adhesive but it does provide the benefit of real-time readings.

Sensor 3: apple watch series 7

This method is pain-free, non-irritable, and highly convenient as users can access their results within seconds. Because the reading can be significantly lower it is not recommended for serious diabetic patients. For an individual who is not concerned about diabetes or any other diseases this method is accurate enough and highly agreeable

### Availability and costing

Sensor 1 can range from 345 - 1000 INR. It is most readily available in all countries and most popularly used in India. Sensor 2 can range from 4,600 to 6,200 INR. It is not readily available in retail stores and is mostly sold through online platforms. The technology is newer and significantly expensive hence is still not as widely used. Sensor 3: smart watches can range from 45,000 to 90,000 depending on the brand. It is most readily available in all countries although not affordable by most citizens in developing nations such as India.

### Discussion

Both of the candidates, male as well as female, showed similar blood sugar concentration averages in sensor 1 and sensor 2 and notably lower blood sugar concentration levels.

The apple watch reading dip lower in candidate 1's reading as compared to candidate 2.

The difference between sensor 1 and sensor 2 reaches a high of 3 points in candidate 2 and in candidate 1 only a high of 2 points.

All the sensors before used in the experiment were first tested on a control candidate to test the accuracy of the machine. The three sensors were first given to one candidate and the readings were checked simultaneously of the same type of sensor. Only is the readings matched the sensors given to the participants of the experiment. The equipment was checked prior to the experiment for any physical faults.

Note: the readings of smart watches may differ depending on the brand all though the same software is used in all watches hence accuracy will also differ from one brand to another

### Conclusion

Overall, considering the doctors of convenience, accuracy, availability and cost sensor 2 - proves to be momentarily the most reliable as is at results nearly as accurate as the and the added advantage of real time readings allowing the user to alter his or her actions in motion. It proves to be of immense aid to individuals with diabetes as it allows then to keep a track of their blood glucose level continually and hence helping in preventing major variations in blood sugar levels for such patients

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## QUANTITATIVELY EVALUATING THE RELIABILITY OF WEARABLE SENSORS IN DIAGNOSIS, TREATMENT AND RECOVERY FROM COVID-19

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### Abstract

Due to elevating incidents of SARS-CoV 2 (engendered by the causative agent COVID-19), the world has seen a greater reliance on wearable sensors like pulse oximeters, pyrometers/ thermometers for the diagnostic, treatment and recuperation stages of the disease. The purpose of this study is to assess the precision, accuracy and viability of these wearable sensors through trials and a survey, and measured these results against similar studies. Wearable sensors were found to play an important role in initiating diagnosis and in recovery.

**Keywords:** SARS-CoV 2; reliability of wearable sensors; diagnosis, treatment, recuperation

### Introduction

More than two years since the beginning of the COVID-19 pandemic, countries are still combating the different variants of the virus. As of 13th April 2022, there have been 499,119,316 confirmed cases, and 6,185,242 deaths from COVID-19 as reported by national governments [1]. Early diagnosis continues to offer high cure rates and yields more effective treatment routes. Reverse Transcription- Polymerase Chain Reaction (RT-PCR) tests are considered to be confirmatory tests to detect the presence of COVID-19. A recent study by the CDC suggests that only about 1 in 4 cases of COVID-19 are reported and only about 1 in 1.32 deaths related to COVID-19 were reported [2]. This large number of actual cases in comparison to the true load of cases, translates to a requirement of a more efficient system for diagnosis of the disease and monitoring the health standards of the patient. An accurate and widely available method is the use of wearable sensors.

Wearable sensors are those devices which can be applied onto articles of clothing or directly onto the skin to measure and interpret biophysiological data. They are used in several medical specialities including dermatology, and electrophysiology etc. Wearable sensors, commonly used for Covid-19, include pulse oximeters and thermometer/pyrometers. The purpose of this research paper is to quantitatively evaluate the reliability of these wearable sensors. This study defines reliability as the accuracy, precision and validity, which is the degree to which a measurement is close to a true value, the closeness between successive measures and the extent to which the data measures what was intended to measure, respectively [3].



### Theory

Wearable sensors include a wide range of different sensor types including piezoelectric sensors, electrical sensors, optical sensors, etc. Of particular importance to diagnosis of Covid-19 are optical sensors and pyroelectric sensors.

Optical sensors are widely used in pulse oximeters, which are used to measure pulse rate (bpm) and blood oxygen concentration (spO<sub>2</sub>): two key vital signs which change upon contracting Covid-19. Optical sensors work on the principle of detecting scattered light which is reflected from internal body structures. The light is introduced artificially by a light emitting source which is positioned in close proximity to the sensor. [4] Pulse oximeters make use of the varied optical properties of haemoglobin and oxyhaemoglobin. When light of 650 nm is introduced, absorbance of haemoglobin and oxyhaemoglobin varies by 414220 cm<sup>-1</sup>/M. Oximeters exploit this characteristic to determine the patient's spO<sub>2</sub>. [5] Photoplethysmography in pulse oximeter machines can be used to determine the pulse rate.

Fever is another symptom commonly experienced when a person has contracted COVID-19. Body temperature can be measured using pyroelectric sensors in pyrometers. Pyroelectric sensors are constructed using a combination of gel and crystalline solution. When these substances are exposed to IR Radiation, their ability to carry electrical charge changes. This change in current can be measured using a sensitive transistor. [6] Digital thermometers work on the principle of changing resistance of metals as temperature changes. A metal probe measures the voltage and a microchip converts it to an understandable reading.

### Experimental

#### 1. Survey

A survey was conducted to assess the viability of wearable sensors for diagnosis and treatment of Covid-19. Participants were asked to enter their age and sex, after which they were asked a series of Boolean, multiple choice and Likert scale questions.

Link of survey: <https://forms.gle/VGi4vQvueyySRiW97>

#### 2. Field experiment

Field experiments were conducted to determine the accuracy and precision of pulse oximeter and pyrometers. 10 pulse oximeters were used 5 times each, and the spO<sub>2</sub> and BPM were tabulated. The mean and standard deviation of the results was calculated to determine the precision of the oximeters. The same procedure was carried out for 10 pyrometers to determine its precision. The results of the same data were then compared with a 'gold standard' thermometer and oximeter. To ensure fairness of the results, the following variables were held constant: the same individual (and thus same age and sex) tested all the devices; all the devices were tested under the same conditions, and the volunteer had the same amount of activity before testing (resting).

### Results

Following is the result of the survey:



Pulse Oximeter										
Serial No	spO2									
1	98	98	97	98	99	98	99	98	98	97
2	98	97	97	98	97	98	98	99	97	98
3	99	98	98	99	98	98	96	98	97	98
4	98	98	98	97	98	98	99	98	98	98
5	97	97	98	97	98	96	97	98	98	99
$\sum x$	490	488	488	489	490	488	489	491	488	490
$n$	5	5	5	5	5	5	5	5	5	5
$\bar{x}$	98	97.6	97.6	97.8	98	97.6	97.8	98.2	97.6	98
$\sum x^2$	48022	47630	47630	47827	48022	47632	47831	48217	47630	48022
$\sigma$	0.632456	0.489898	0.489898	0.748331	0.632456	0.8	1.16619	0.4	0.489898	0.632456
Average standard deviation =				0.648158						

Pyrometer										
Serial No	Body temperature/ °F									
1	97.3	95	97.5	96.6	97	98.3	98.1	96.8	98.4	98.1
2	97	97.3	97	97.3	95	97.2	98.4	97	98.2	97.5
3	96.4	97.4	98.2	97	96.3	98	97.3	97	97.1	96.8
4	97.4	98	97.1	98.3	96.3	96.2	98.1	97.6	96.5	98.2
5	98	96	96.8	96.5	97	97	96.9	96.9	97.7	97.4
$\sum x$	486.1	483.7	486.6	485.7	481.6	486.7	488.8	485.3	487.9	488
$n$	5	5	5	5	5	5	5	5	5	5
$\bar{x}$	97.22	96.74	97.32	97.14	96.32	97.34	97.76	97.06	97.58	97.6
$\sum x^2$	47260.01	46799.05	47357.14	47182.99	46390.38	47378.17	47786.68	47103.61	47611.75	47630.1
$\sigma$	0.584808	1.21573	0.554076	0.723187	0.816701	0.835464	0.630872	0.31305	0.785493	0.570088
average standard deviation =				0.702947						

spO2 on 'gold standard' oximeter= 98; bpm on 'gold standard' oximeter= 91; temperature on 'gold standard' thermometer= 97.3

### Discussion

The following observations were made from the experiments (survey and field experiment):

1. **Diagnosis:** Fig 1a suggests that almost three quarters of all the people who have ever taken an RT-PCR test have used wearable sensors to measure their symptoms before taking a confirmatory test. Furthermore, Fig 1b suggests that 52% of people were compelled to some or complete extent to take an RT-PCR test from their sensor readings. On the contrary, 31.2% of people were not at all compelled to take the test. These statistics suggest that a majority of people rely on wearable sensors to measure their symptoms but only about half the people rely on sensor data to the extent that they get a confirmatory test. Fig 1c is indicative of the fact that in only 45.5% of the cases, a fever/low oxygen concentration resulted in a positive RT-PCR test. This is, however, due to the fact that the symptoms experienced by Covid-19 patients are very similar to other commonly occurring diseases such as influenza.
2. **Recovery:** Fig 2a demonstrates that 67.5% of all Covid-19 patients measured their vital signs using wearable sensors frequently or very frequently. On the other hand, only 25.7% of people reported that they measured their vital signs infrequently or never. Fig 2b suggests that 67.1% of people reported their vital signs to their family physicians. This insinuates the fact that almost 7 out of 10 patients depended on wearable sensors to measure the severity of their symptoms and also reported them to their primary care doctors. This is more than the percentage of people who were convinced to take an RT-PCR test when experiencing symptoms- indicating that reliance on wearable sensors increases upon getting a positive result for the confirmatory test. Fig 2c suggests that only 44.4% of people solely relied on normal vital signs from these wearable sensors to end their two week quarantine period. Greater reliance was shown for negative RT-



PCR test, suggesting decreased credence on sensors.

3. Treatment and prognosis: Fig 2d is indicative that 58.9% of physicians asked their patients to send them their vital signs as measured by these wearable sensors. They take this into account in order to determine the severity of viral load and thus accordingly prescribe dosage and type of medicine. About 35.6% patients did not send their vital signs to their doctors- maybe due to being asymptomatic or experiencing very mild symptoms. Similar statistics are reinforced by fig 3a in which 54.5% of healthcare staff reported basing their route of treatment partly or completely on sensor data.

Similar results to the field experiment were obtained by previous studies such as those by Dukinget al. (2018) [7] and Dong et al. (2019) [8].

### Conclusion

From the results of the field experiment, the precision of pulse oximeters for spO<sub>2</sub> and pyrometers for temperature is quite high. Digital thermometers are likely to have an even higher degree of precision. BPM measured using oximeters is less precise and has a larger standard deviation. The accuracy of oximeters for measuring spO<sub>2</sub> is quite high when compared to the 'gold standard' machine. The accuracy of oximeters measuring BPM is a little inadequate. The accuracy of pyrometers is also high, but digital thermometers are likely to have higher accuracy. From the survey it can be deduced that wearable sensors are quite viable for diagnosis, treatment (prognosis) and recovery.

The limitations of this research are that only the wealthy can afford wearable sensors and the survey sample size may not be representative of the entire Indian population since it is challenging to make the survey accessible to all sects of the society. Furthermore, it is challenging to measure utility on a Likert scale and satisfaction differs for each individual.

### Acknowledgement

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### HOW GLOBALIZATION AND THE NEED FOR INCREASE IN WORLD EFFICIENCY REQUIRE BOTH KNOWLEDGE AND AGRARIAN ECONOMIES

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#### Abstract

With the growth of knowledge economies and the importance of information being palpable, the production, distribution and use of this knowledge in all aspects of society is increasingly significant. When global ‘foodbaskets’ like Ukraine and Russia have threatened food security around the world, when demand for food and agriculture from China, India and Sub-Saharan Africa particularly is expected to grow considerably over the next decade and when the need for improvements in the agricultural sector to prevent any environmental ramifications is at its highest, the aim of this study is to show the significance of moving from resource-based agriculture to knowledge-based, scientific and sustainable agriculture.

**Keywords:** Knowledge-based; sustainable agriculture; food security; intellectual capital; Knowledge Economy Index

#### INTRODUCTION

The advancements in technology and enhancements in knowledge indeed hint at a potential shift from traditional agrarian economies to knowledge economies. Knowledge is essentially information, and can be instilled in every economic structure. The World Bank says that to participate in the knowledge economy, a country needs four “pillars”:

1. an educated and skilled population
2. technology infrastructure
3. a *regime* that encourages technology and entrepreneurship
4. a tightly knit network of public and private research organizations

The future of economies, however, must not be seen as Knowledge “or” Agrarian, but Knowledge “and” Agrarian. With PwC estimating that roughly 1.5 million new people become part of the global metropolitan population every week, there’s no getting away from the fact that agrarian activities will always be necessary. [1]

#### Theory

Theoretically, the growth of knowledge and intellectual capital in an economy broadens the scope of the resources in an economy, whether that is the flexibility of labor or the innovations in technology. Revamping an economy’s resources channels from the idea of resource-based production to knowledge-based production, which develops the resources in itself. To enhance distribution of knowledge and human capital, education must undeniably be improved. These intellectual gains can then be implemented in crucial sectors like agriculture to combat the



challenges posed in the form of climate change and food insecurity. Agricultural modernization must be in place for developing nations to achieve high-income status. Modernization also helps achieve humanitarian goals by raising incomes and productivity of poor farmers, lowering food prices, and augmenting soil fertility and in turn, nutrition. A nutrition intervention in Guatemala led to a 46 percent increase in wages for these children as adults above those who did not receive the intervention. [2]

### Experimental

Moving from theory, the effectiveness of knowledge in boosting productivity must be assessed. Attributed to the World Bank’s Knowledge Economy Index (KEI), the experiment uses the institution’s 4 pillars of the knowledge economy, as shown in Fig 1, and 12 knowledge indicators, where each one accords to one of the 4 pillars, as demonstrated in Table 1.

PILLAR 1 Economic and institutional regime	PILLAR 2 Education and skills	PILLAR 3 Information and communication infrastructure	PILLAR 4 Innovation system
The country's economic and institutional regime must provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.	The country's people need education and skills that enable them to create and share, and to use it well.	A dynamic information infrastructure is needed to facilitate the effective communication, dissemination, and processing of information..	The country's innovation system—firms, research centers, universities, think tanks, consultants, and other organizations—must be capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology.

**Fig. 1** The four pillars of the knowledge economy [3]

Pillar	Indicator
Economic and institutional regime	<ul style="list-style-type: none"> <li>• Tariff and non-tariff barriers</li> <li>• Regulatory quality</li> <li>• Rule of law</li> </ul>
Education and skill of population	<ul style="list-style-type: none"> <li>• Adult literacy rate</li> <li>• Gross secondary enrollment rate</li> <li>• Gross tertiary enrollment rate</li> </ul>
Information infrastructure	<ul style="list-style-type: none"> <li>• Telephones per 1,000 people</li> <li>• Computers per 1,000 people</li> <li>• Internet users per 1,000 people</li> </ul>
Innovation system	<ul style="list-style-type: none"> <li>• Royalty payments and receipts, US\$ per person</li> <li>• Technical journal articles per million people</li> <li>• Patents granted to nationals by the U.S. Patent and Trademark Office per million people</li> </ul>

**Table 1** Mapping the knowledge indicators to the four pillars of the knowledge economy [3]



Each country is scored from 0 to 10 on each of these indicators, and the KEI is then constructed by eliciting a simple average of the 12 scores. A KEI score that is close to 10 implies relatively good development of the four knowledge economy pillars as compared to other countries, while a score close to 0 indicates relatively poor development.

### RESULT

Taking the case of Iran during 2008-2009 in this study, the average of KEI increased from 4.07 to 5, inferring a relatively “poor performance” of Iran in this index. Moreover, the results also showed the positive implications that capital stock, employment and the Knowledge Economy Index have on agricultural growth. Out of the elasticities of capital stock (0.26), employment (0.075) and that of the Knowledge Economy Index (0.90), the most significant one is of the KEI, deducing the importance of knowledge in agriculture. [4]

### DISCUSSION

While the results depict how imperative knowledge in economies is, and how it can significantly increase agricultural growth, over-reliance on the same may not always be beneficial. The knowledge economy may have elongated the income inequality between high-skilled and low-skilled workers, which may worsen the income distribution considerably in developing countries driven by agriculture. The knowledge economy may also be a factor behind the rise of the ‘Gig economy.’ This creates more opportunities for those with high intellectual capacity, but those with lower skills may find work increasingly temporary and low-paid, increasing job-insecurity. Knowledge must not be restricted to these two sectors, but in fact, must be pervaded around the world, even in diplomacy! The war in Ukraine has increased the importance of agriculture extensively, with Russia and Ukraine accounting for about 29 % of the global wheat export market.

Substantively, Ukraine’s contribution to the world food market in 2021 is equivalent to the food of about 400 million people, not counting the population of Ukraine. By 2030, it is planned to provide food for 1 billion people worldwide. [5]

With respect to climate change, the agriculture sector, together with forestry and other landuses, contributes nearly a quarter of all anthropogenic greenhouse gas emissions (GHGs). Half of this share comes from direct agricultural emissions, mainly from livestock, with most of the rest from deforestation of which agriculture is the main driver. These, once again, do not point at a need to shift from agrarian economies, but need for innovations in such economies.

### CONCLUSION

Actions are urgently needed. Urgently, to tackle food insecurity and the climate crisis. According to estimates by the UN Food and Agriculture Organization, COVID-19 has led to a sharp increase in undernourishment with between 720 and 811 million people in the world facing hunger in 2020, 118 million more people in 2020 than in 2019. [6] These improvements require intellectual capacity. Farmers in many OECD countries have made improvements in the use and management of nutrients, pesticides, energy and water, using less of these inputs per unit of land. Farmers have also made good progress in adopting more environmentally beneficial practices, such as conservation tillage, improved manure storage, or soil nutrient testing. [7]





At the forefront of these issues, policy makers must take radical measures. Keeping in mind the results of the World Bank mentioned above, governments need to innovate and foster innovation. In India, the National Innovations in Climate Resilient Agriculture (NICRA) project launched by the Indian Council of Agricultural Research analyses certain villages, and forecasts the level of risk of climate change events through the aid of research and technology. This information then enables them to help build farmers' resilience to climate fluctuations and extreme weather conditions.

Digital opportunities are vast. Tools and technologies can assist governments to improve consumer health and the sustainability of food systems. These tools can be used to encourage consumers to buy healthy and nutritious foods and foods produced through sustainable farming practices, as well as to reduce asymmetries of food labelling schemes. They also contribute to more effective food data collection systems that can inform policy decisions, including by combining commercial sales information with national dietary intake survey data.[8] Lastly, the benefits of globalization must be exploited, by expanding the distribution of global knowledge. First, globalization allows countries to gain easier access to foreign knowledge. Second, it enhances international competition—including as a result of the rise of emerging markets—and this strengthens firms' incentives to innovate and adopt foreign technologies.

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### IMPACT OF LEADERSHIP ON ORGANIZATIONAL PERFORMANCE

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#### Abstract

The specific topic being examined is how different leaderships impact organizations and why this is. The objective of this research is to find the leadership styles most suited for firms. The conclusion shows the styles that are most impactful and utilized today while the paper describes the reasons for the success or failure of these styles while examining leaders who used these styles.

**Keywords:** Autocratic, Democratic/ Participative, Laissez-Faire, Charismatic, Transactional

**Introduction:** The correct style of leadership is the most basic requirement of any form of business. There are a wide range of many diverse leadership techniques that have been used over the generations. The 5 styles being analyzed in this paper are autocratic, democratic, laissez-faire, transactional and charismatic leadership. To be successful, leaders have to combine styles and use different types of leadership according to the situation. Thus, the leadership style of any CEO, head, etc can rarely be identified as one. In this literature review, the most prominent leadership traits have been used to categorize them into different leadership styles and analyzed them on the basis of books, interviews, etc made about them in the past by their peers, business partners, employees, etc.

#### Theory:

**Autocratic Leadership:** Authoritarian leaders maintain control over all decisions being made with little to not input from other people. They tend to be overpowering, extremely assertive and sometimes dictating. They make speedy decisions, useful in competitive markets where firms are perpetually readjusting, provide well-defined instructions for its employees and help provide invaluable framework to organizations. However, in forms where original and innovative ideas have to be created relentlessly, it blocks creative input from its workers, creates a very inflexible and stringent work environment for its employees which impacts morale poorly. Autocracy can be an off-putting style of leadership to work under and has a negative connotation but there have been many successful and well-known business leaders who have used this style in a competitive, evolving markets to change the game. A famous example is Jeff Bezos. He is also widely known as a transformational and experimental leader, owing to his contributions and advancements in reforming Amazon in the global market and many of his traits in the running of his organization do indicate that he is an authoritarian leader. Jeff Bezos was impolite to his workers, overconfident and made some hasty decisions but while Amazon made some very risky gambles under his leadership, it is a shining example of a thriving company governed by an authoritarian. Thus, autocracy has highly efficient workplaces and quick results but employees

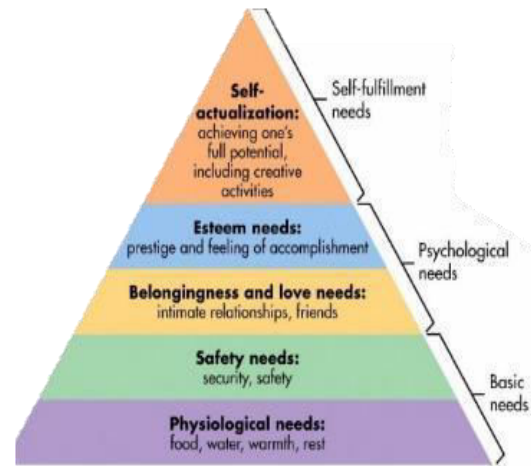


do not generally prefer this style as it restricts their freedom, makes them feel resentment or irritation which increases employee turnover rate. Some of Amazon's employees said, in a survey, 'Sometimes is worse than a prison' and 'You don't feel valued at all'.

**Participative Leadership:** Participative leadership, more commonly known as democratic leadership, gives importance to involvement of its stakeholders. Employees in participative firms tend to be more motivated and have higher levels of job satisfaction. Democracy encourages teamwork which creates healthy work environments and increased innovation. Since the issues of the organization are shared with the employees, they feel included leading to low turnover rates while the employer has less pressure to solve the problem as the employees offer a variety of unique solutions. However, as a number of ideas are considered, many are rejected which causes resentment. A prominent disadvantage of participative leadership is that the leader is forced to consider every worker's opinion, even if it not their area of expertise which leads to unnecessary discussions and prolonged decision making which is a drawback in shifting markets. Another issue is that of the 'Yes Men' who simply agree with the leader and do not actually offer their own opinion in fear of authority or spotlight. This is named the HiPPO (Highest Paid Person's Opinion) effect which can be detrimental to the company as the idea of a democracy to not rely on one person's decisions. While there are many examples of highly successful companies utilizing democracy, one of the most groundbreaking organizations would be Google. One of the methods used are weekly meetings which are joined by all of its employees with whom important information is shared followed by a question-answer session which allows doubts to be addressed.

**Laissez-Faire Leadership:** This style of leadership essentially is completely reliant on its employees as the leadership themselves play little part in the actual process and adopt a 'hands off' philosophy. Skilled employees thrive in these work environments as they have all the needed resources made available to them and due to the creative freedom, they innovate as much as they want which is a huge motivator. Employers see a high retention rate from this style as the job satisfaction levels of their employees are high. However, all workers are not experienced & skilled and they require guidance for work to be done well. As each person is essentially working on their own terms, there is no threat to meet a specific deadline as the probability is that they won't be held accountable. As there are no specific directions, there is a lot of confusion because there is nobody to look to for answers to or a specified job to complete. It can also greatly weaken the authority of the leader as the employees may not see the leader as their superior. A very important disadvantage is passive-avoidant leadership. This is a form of laissez-faire leadership when the leader fundamentally ignores its workers troubles, avoids taking the important decisions which causes an absence in leadership which can impact the company badly. Warren Buffet of Berkshire Hathaway is one of the most successful laissez-faire leaders today, named fifth richest in Forbes' list. While he closely monitors his employees work, he does not usually interfere with their work. He pays very close attention to workers which is evident from his annual report where he praises individual employees for their work which is an excellent motivational method.

**Transactional Leaders:** Transactional leadership focuses on a reward-penalty system that is used to motivate employees, essentially a less severe version of autocracy. The leader provides clear-cut instructions which makes work more understandable for its employees and provides invaluable framework to organizations, a structure that relieves pressure and increases efficiency. One of the major benefits of using transactional leadership is that employees tend to be mostly self-motivated because they can typically choose the rewards for their work. However, as with autocracy, it greatly reduces innovation in the workplace and employees tend to follow rather than offer an actual opinion due to



excess importance given to rules. There are very impersonal relationships between leaders and employees which disincentivizes them. Another problem that has been previously analyzed by researchers is the matter of accountability because workers are held answerable in matters where the leader's delegation is at fault. Rewards in transactional leaderships focus on satisfying the levels of Maslow's hierarchy. Bill Gates is a transactional leader and under his leadership, Microsoft revolutionized the market. Bill Gates makes frequent checks on his employee to make sure everything is going as it should and was an efficient leader. He promoted sharing ideas in the workplace but if he didn't like them, he was very discouraging. This demotivated many employees and caused many talented workers to leave Microsoft. To conclude, transactional leadership is a good practice that satisfies both employees and employers. However, leaders must keep in mind that while intrinsic rewards motivate their workers, employee can be very demotivated with their job specifically due to the matter of accountability and lack of freedom. (researched/proven by different studies over the years).

**Charismatic Leadership:** Charismatic leadership relies on the leader's personality, persuasiveness and confidence. Charismatic leaders tend to be confident, creative and good communicators. Leaders form personal connections with their employees which reduces turnover rate greatly. The main goal is shared by everybody which raises morale and creates a sense of unison. A charismatic leader relies on emotional appeal and thus, employees tend to be self-motivated to achieve their objectives. However, charismatic leadership is extremely dependent on the leader. It often happens that leader experiences burnout which brings down the motivation and energy levels of the whole organization. It's also common for the leader becomes the 'do-all, be-all' of the organization which has potential to harm the company as if the leader is not there, nothing will be done. In other cases, the leader is the face of the company and customers use it because they trust the leader and this can cause problems when the leader changes. Another disadvantage is that the leader must be accepted by most of the employees for this type of leadership to work. Charismatic leaders often tend to be either transformational or transactional as well and utilize methods of motivation from these leadership styles.



### Conclusion

In conclusion, while autocracy does help accomplish goals, it often has overall negative impact on the employees. It decreases job satisfaction and is not an advisable leadership style. Participative leadership style is frequently used today and for good cause, as it brings satisfaction to employers, employees, customers, etc. This leadership style combined with others makes a good combination for a successful leader. Laissez faire can be beneficial to workers and employers but is highly inefficient in many cases and has virtually no crisis management capability. It is extremely ineffective without both experienced leaders & employees. Transactional leadership is efficient and useful but close to useless in fields where innovation is required. It is not advisable alone but combining it with others can lead to better results. Charismatic leadership's main threat is that of creating followers instead of leaders but there is ready availability of assertive employees and this is a motivating leadership style that is extremely useful. I would recommend this combination: Participative/Charismatic with Transactional.

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### PERSONALIZED MEDICINE WITH TECHNOLOGY

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#### Abstract

Modern problems need modern solutions. The same is the case with medication, earlier patients were treated with the symptoms they felt, and later they were treated with a diagnosis performed with the result of a series of tests, but now we aid patients considering their genetic profile. Personalized medicine shifts the “one size fits all” approach to "personalizing the medicine". This is done efficiently and precisely with the assistance of technologies like AI and Big data. AI is implemented in numerous ways to personalize medicine. This paper highlights the types of data collected, how is this data managed, and mainly the interpretation of this data. In addition, it also puts forward the history of personalized medicine.

#### Keywords:

Personalized medicine, AI, Machine learning, Big Data, Precision Medicine.

#### Introduction:

Personalized medicine is the use of the genetic profile of the patient for appropriate medication and aids in the perfect amount of dosage. In the process of collecting and storing the humongous amount of data from the patient's input, big data technology is used. Big data is a massive and complex set of data that is considerably large to be interpreted by a human or be handled by the daily use database software. Artificial intelligence (AI) in use for personalized medicine is for pulling out trends and patterns from complex datasets, giving you very valuable insights to work on. In the case of personalized medicine, big data is like an ocean and AI is like a ship to navigate through it.

#### Theory:

##### History of personalized medicine

On April 16, 1999, a brief article was published namely “New Era of Personalized Medicine: Targeting Drugs for Each Unique Genetic Profile,” by The Wall Street Journal and this was the first time when people knew what personalized medicine was. This idea was made more realistic and brought to life at the start of the 21st century with the aid of the Human Genome Project. The project created a link between health and the genetic makeup of a person, enabling doctors to perform the genetic mapping. The mapping displayed that it's only 0.9% that make individuals



different, and also proved why different people react to medication differently. This also showed a need for personalized medicine to tailor to the needs of different beings in a personalized way.

### **What are the different types of data collected?**

Routinely accumulated patient information and inputs have a rising volume with time. The largest volume is the imaging data as it covers gigapixel images of tissues and organisms at subcellular resolution, and metadata and quantitative measurements. This data also includes structured (e.g. ICD codes) and unstructured (e.g. symptoms descriptions) content of electronic health records, which were originally made to convey patient information among clinicians. In addition, whole-genome sequencing (WGS) and whole-exome sequencing (WEX) are even stored. With the introduction of fitness bands and sensors, data generated for wearable devices and lifestyle tracking mobile apps is becoming an increasingly relevant big data type in Personalized Medicine nowadays.

### **How is the data managed?**

Biomedical datasets display unique features, like highly distributed acquisition, format heterogeneity, and content sensitivity. To address this, "General Data Protection Regulation (EU)" 2016/679 has developed a framework for ethical and anonymous data processing, and this has a notable impact on the research. Patients' anonymity is maintained with the use of Blockchain-based cryptographic techniques. Moreover, cloud computing is in action to deliver software and storage solutions, enabling stakeholders to use resources 'on demand' to foster reproducibility. To be effective, biomedical data should be Findable, Accessible, Interoperable, and Reusable. For the biomedical datasets to be managed and stored, high-performance computing (HPC) is used. Supercomputers are a need of age for handling complex problems with data tasks. Input/output advancement plays a significant role in facilitating efficient big data handling.

### **How are Biomedical datasets analyzed and interpreted?**

Biomedical big data takes into account ensembles of complementary information retrieved from a combination of sources, which is referred to as multi-view data. These data can be examined with integrative workflows. Machine learning methods are efficiently employed for integrative solutions for the data to explain an event or predict an outcome. Biological datasets certainly put forward some structure of patterns, like a group of genes performing identical functions, and a common approach to these datasets is Sparse Group LASSO (Least Absolute Shrinkage and Selection Operator). A stock of highly precise and flexible neural network-based machine learning techniques that in the last few years have been successfully applied to domain-specific applications. Deep learning is particularly applied in the classification of medical images and videos, often in combination with the processing of Electronic health records. The enormous size of aggregated biomedical data displays different levels of data dimensionalities, sample sizes, sources, and formats. Certainly, small datasets with fewer samples, and class imbalance, represent substantial problems typical in many areas of biomedicine. Data augmentation, which is creating negative examples, and transfer learning, which is repurposing features of established models are used to address the problem. Modern machine learning techniques such as weak supervision are used to automatically generate data labels to be used for deep learning model



training. A series of new technological advancements inspired by neuroscience and established on natural language processing and computational linguistics are referred to as cognitive computing. This type of computing pursues a dynamic process of observation, interpretation, evaluation, and decision.

### **What are the limitations of AI?**

Careful testing needs to be performed on health care products rooted in AI. This is motivated due to varying results observed with the use of some AI in health care products, for example, IBM's Watson treatment decision support system. A need for level best testing is because if the systems are trained on partial and incomplete datasets, they will indeed give misleading results. In addition, in basket trials, if drugs don't match the patient profile scheme better than traditional healthcare then the scheme can be questioned. It could be that the medicine is ineffective or some portion is inadequate to make the whole matching scheme ineffective. In contrast, even if the medicine works, but does not match the profile perfectly which may give abnormal results, and still questions can be raised. Moreover, AI-based technologies like deep learning and neural network-based algorithms, give dependable predictions if enough training datasets are used. Even though the predictions are reliable, it's hard to understand the link between input and output. Thus, the 'Black Box' problem in the context of AI can be problematic as it evokes a sense of fear and lowers the confidence in relying on these modern technologies.

### **Conclusion**

A shift towards personalized medicine is positively transforming the medical field. The usage of modern-day technologies is helping clinicians and researchers understand living beings to their molecular level with preserving their individuality and uniqueness. Currently, an enormous amount of multi-omics, imaging, medical devices, and EHR data are available from large-scale cohorts and population studies, revealing subtle differences in human genetics. Cutting-edge machine learning techniques like deep learning and platforms for cognitive computing are tool case for the upcoming data-driven analysis in biomedical big data. Technological advancement in the field will surely provide us with medicines with greater precision and help humans survive a pleasant life.

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### EMPIRICAL ANALYSIS OF LEADERSHIP SHAPING THE FUTURE VENTURES OF A BUSINESS MANAGEMENT (IMPACT OF LEADERSHIP ON BUSINESS MANAGEMENT)

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#### Abstract

This paper is subjected and focused to state what leadership means and how it is broadly classified into several categories. Now that it is the key word and holds weightage in every part and parcel of one's life the paper also explains the importance of leadership and even discuss the relevance of the same in business management. To have a successful business each leader inculcates a leadership style which is also expressed in the paper. Furthermore, it clarifies that whether leadership is essential and compulsory in the field of business management. All the resources have been gathered and expressed in own words (including opinion, perspective and understanding) from primary and secondary sources.

**Keywords:** leadership styles in business management, effectiveness of leadership, characteristics of leader, measure of effectiveness

#### Introduction

Leadership is the quality of being a leader. And a leader is the one who takes the responsibility to guide the members involved in the group. They are the one who lead and take in charge of the group so that each one of them reach new heights individually and as well. For the same there are diverse ways leaders manage their group. There are three major types of business styles that are implemented in the business management that was identified by Kurt Lewin in 1939<sup>[1]</sup>. The business management is incomplete without inculcating and practicing these. Leadership is not only about maintain decorum and smooth functioning of the organization but also making sure the resources and the related tasks are distributed fairly on concrete evaluation of the members forte and interest.

#### Theory

Leadership is not a trait that can be achieved overnight. Management and leadership might sound synonymous however they are different terms. A manager can be a leader but not all leaders can be managers. The leaders motivate and guide the members of the business to perform better but it is the manager who springs into action to express these traits. In this way he/she performs all the functions of management that include planning, organizing, commanding, coordinating, and controlling.

Leadership is playing an integral role in all the businesses. 38%-leadership and management 34%-employees 17%-products and services 7%-suppliers and clients 5% systems and procedures<sup>[2]</sup>

Now that the situations keep on changing there are separate ways in which a leader prepares and improvises the team. During the business management a leader must play like a bridge in linking



between the buyers and sellers and suggest and implement changes as and when needed. Now a days the leader does not need to stay at the top-notch position so the development of hierarchy in which people work under one and other thus flattening the organization is somewhere connected to laissez faire but here no one will supervise anyone, but the advice and correction can be passed in the whole circle instead.

The companies are progressing by developing onto the mental factor of the employees. The same is conducted by the leader.

- **To teach (coach) the people to self-development and improvise with the advancing AI and technology.**-This is mixed with transformational leadership (it is a theory of leadership where a leader works with teams or followers beyond their immediate self-interests to identify needed change, this way there will be efficiency in the business management.
- **Training workers to develop soft skills.**-The book-based knowledge can be acquired by all however it is the leader in the business management who makes sure the employees communication and presentation skills are at par. By this there is investment in human capital that is less preferred because the results have a time lag although there is a boost in productivity.

Real life approach to these methods is unique for each leader (a businessperson) therefore there are a diversified styles of leadership as well.

**Autocratic/authoritative style** -Here the leader is the decision maker and giver of the group and does not openly involve everyone in decision making therefore it is also called leader centered style. The autocratic style is incorporated during crisis when a leader is most valuable. You need someone who takes spontaneous complex decisions which can be taken without discussions and meetings. These contingency decisions made prevent immense loss to be incurred.

To start with, let us take into consideration Jeff Bezos best known as the Founder and Chairman of Amazon (online shopping website) who now has a net worth of USD\$ 171 billion. He had a successful business because of his autocratic style. In total he focused on the potential factor of leadership

**Democratic/participative style** -Here the leader has concern for both the people and the work. He makes a final decision only after consultation with the subordinates. This is the most effective method for day-to-day work as it allows the group to take part in decision-making. This gives teams a feeling of ownership over projects. <sup>[4]</sup>

For instance, the founders of Google, Sergey Brin and Larry Page were successful to inculcate the characteristics of the democratic leader. Where in the workers and the leader are equally important while making any crucial decisions for the business. This not only initiates fresh innovative and creative methods of production which boosts productivity and efficiency helps the firms achieve economies of scale also.

**Delegative/free reign/laissez faire style** -A manager/leader gives complete freedom to his subordinates giving independent personality. The entire decision-making authority is entrusted to them. There is least intervention by the leader and so there is free flow of communication. It is important to make sure each team member has the right skill level (then only no supervision is required) and self-direction capability.

For example, Arianna Huffington who is the Founder and CEO of HuffPost. She developed an environment that led to qualitative improvement. For the same she spent on human capital to



boost efficiency. For instance, she installed sleep pods so that the exhausted workers get enough rest to revitalize. This form of leadership comes under the delegative style of leadership.

### Experimental

To measure the leadership sectors in the fields one can, use thePMD formula (potential, motivation, development)<sup>[3]</sup>

For the same there were questions asked to the businesspeople in various fields. These questions determined and fetched the importance of leadership on business management by targeting the three key factors of traits(potential), tactics(motivation) and transition from idea to reality (development).

Questions for the interview of people (25) from different fields of different leadership style  
8-autocratic; 5-democratic; 12-laissez faire

#### 1. Difference between manger and leader

18/25 people found the manager as the person who executes the ideas and instructions given by the leaders. As the name suggests a leader is the manager. The 6/25 find them to be synonymous words.

#### 2. What is/are the role(s) of a leader in business?

8/25 under the autocratic style consider the leader to guide and command the fellow members. On the other hand, 6/25 of the people of the democratic style find the leader to be a moderator who accepts others' ideas and give improvisations instead. Finally, the remainder who are under the laissez faire style describe the leader's role to supervise the business in general and solve the minor and major obstacles.

#### 3. On what basis one gives a reward/incentive?

All the leadership styles follow the common route of bonus and overtime time pay which come under the extrinsic monetary factors. The reason for the same is that intrinsic motivation is often short lived and has scarce impact on the member. Furthermore, the industries consider the quantity the priority then the quality (as it can be altered and easier to achieve since majority of the production is capital intensive).

#### 4. What you do when you (your business team) achieve failure instead?

12/25 of the people under the laissez faire spring into action and transform to take up the autocratic style which helps them to bring the business back on track because a lot of thinking and no work also invites disasters. Those under the autocratic style convert to democratic instead for short term period since being the leader they realize their planning and ideas aren't satisfying.

#### 5. Is leadership important or the title. Was there a time you owned up the leadership although you weren't the leader?

12/25 (democratic and autocratic) consider it to be important because it helps in maintain dignity and status. Being selected as a leader means they have the potential. The leaders have the traits of self-respect and confidence that is boosted with not only their actions but also tag. The remnant, under the free-reign style don't consider it to be necessary as the leader is just the supervisor and not the manager since all the tasks are distributed equally within the business group itself.

#### 6. Which one is better, long-term profit or short-term profit and why?



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It all depends upon the type of product produced and the market for the same. Although the short-term profits are found to be more rewarding at the current time for 3/5<sup>th</sup> of autocratic leaders and 1/5<sup>th</sup> of the laissez-faire leaders.

### 7. Is the flat organization (without hierarchy so no leader) a fad (trend) or the future? And why?

Here all the leaders interviewed accepted and stated that the flat organization is not that effective because the true potential of the workers are not recognized. Furthermore, there is no factor of promotion involved which is something the members often aim at. The leader of the democratic stated- “A business without a leader is like a proposal left unexecuted.”

### Result

The interview conducted amongst the leaders coming under the three main leadership styles states that it is very important for a leader to be present in the business management because they are the one who have the potential to propose, plan and execute the plan of action. They provide the members incentive to work efficiently and productively and polish the participants by identifying their true innate talent. The flat organization system is just a new setup by the Generation Z since they don't expect supervision, order, and restriction which the leader sometimes opts for.

### Discussion

Towards the end of the experiment, we can determine that there is always one leading body that takes in charge of the business management. They not only lead but also guide the workers under them. Although each worker is always going to be responsible for their own task however a source of recommendation and correction is eventually going to mold their work into a masterpiece. The people interviewed were optimistic about the further preference and acceptance towards leadership as they state that the leaders can multitask in business and imbibe various virtues in either of the leadership styles.

### Conclusion

A successful leader in business management is the one who can set new benchmarks for others and inspire them to infuse characteristics of morale and self confidence in themselves. The way a leader behaves and takes decision depends on the position and situation he/she stands in. The leader who is at the top of the hierarchy often has the autocratic style since he decides and puts up the plan of action. On the other hand, the middle level leader tends to be delegative since she/he is the one who has daily connection with the team and is well versed with the progress as well as the challenges in executing the plan. However, the point of view keeps revising for instance the flat organization (part of the experiment). In the upcoming future it is likely that flat organization may become more common. To find out more about the same the leaders can implement either in phase, pilot, or parallel modes, keeping in the mind the costs and benefits. Leadership is just not a skill but a helping tool kit that has the capability to run the whole business smoothly. Thus, it is rightly said by Jack Welch-,” Good business leaders create a vision, articulate the vision, passionately own the vision, and relentlessly drive it to completion.”



### Acknowledgements

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### IMPACT OF LEADERSHIP IN BUSINESS MANAGEMENT

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#### Abstract

This research paper outlines what exactly is the impact of leadership of business management and how leadership can change the scenario within a blink of an eye. The main objective of the paper is how to solve the problems that arise in the business's management due to leadership. The main problem that comes up according to me is the resolving of issues or the conflicts within the business and a very considerate solution could be the leader should be authenticated towards all parts/ portion of the business.

**Keywords:** democratic style of leadership, conflicts IBM- International business machines

#### Introduction

All over the world governments recognize the importance of having the business that dominate most of the economy or the Gross domestic production of the country. Similarly does India, factual data states that 70% of India's GDP is brought by privately owned businesses. Now, this sector being one of the most important sectors of the country is the main contributors for the economy of the country and no government would want these sectors to decline. Therefore, the impact of leadership would affect the rate of production and the productivity of the firm and if this continues in all others firm the scenario of the economy of India could change. This research paper provides a detailed information of how leadership can be taken negatively and what are the solutions that could be taken in order to stop the domination of the leader and make the leader cooperate with others.

#### Theory

There are various impact the leadership could have on the business management. They could be categorized into two types positive and the negative impact. In this section, I will outline the negative points so that the solution can be made on the negative to bring out the positive changes. To begin with one of the biggest problem arising due to leadership is issues of conflicts within the firm. There are various scenarios where the employees do not like to be dominated and this creates conflicts between the leader and the employee. For instance, Every one of us being familiar with Google, it is one of the most successful companies but behind the curtains it is having a high labour turnover, Google employee Noam Bardin who worked in the company since 2013 said that Google could have difficulty renovating because of the tolerance of the leaders remains low. Also, problems like not providing feedbacks to the employees on their work can demotivate he workers. Moreover other problems like not making time for the group, failing to define the goals, misunderstanding each other can lower the productivity and



also increase the internal and external conflicts of the business or the firm. A very firm example for the context is John Akers also referred to as “the leader who lost the PC market” Under Akers’s leadership, IBM lost its spot as the unrivaled giant of hardware and software to a new crop of market disruptors. Akers felt that IBM needed to get its PC to the market fast, and this ended up being the most unsuccessful static error licensing Intel microprocessors and Microsoft software, rather than developing those components internally. Akers realized that the future of IBM was in software, not hardware, and pushed for a reorganization that would have divided the huge company into smaller independent businesses. But Akers was reluctant to make the aggressive staffing cuts that the reorg demanded, opting instead for softer measures, such as offering older workers financial incentives to retire.

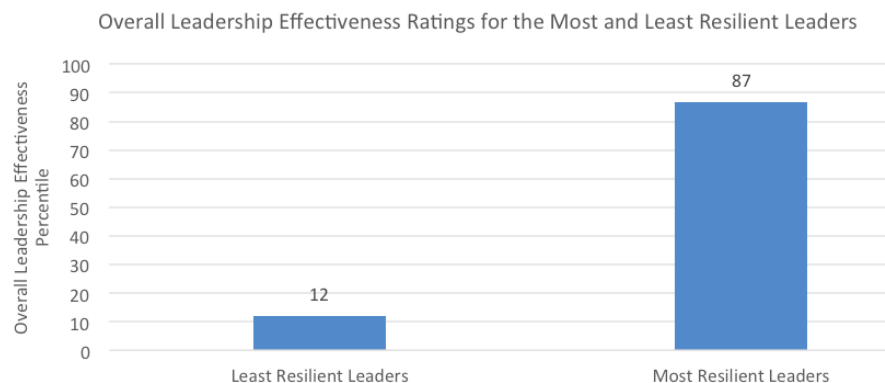
### RESULT

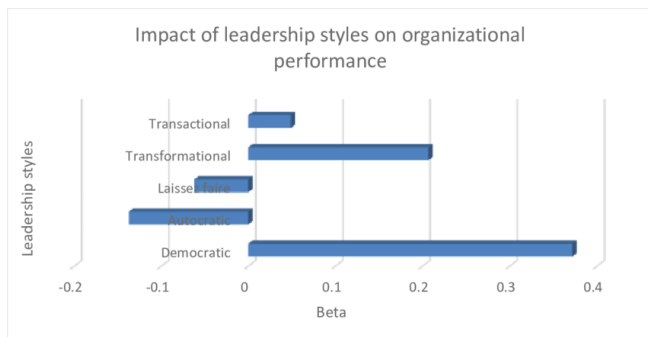
According to me, the research paper concludes that there is a very high impact of leadership in the business management. A very minor mistake in the primary task to of the leader that is to make decision fails, then even if the business is strong enough to exist in the market and can be a strategic champion due to this minor mistake everything can turn upside down. Therefore for the business to avoid that problem a major solution could be “A PERFECT LEADER”, many may argue that it might be impossible for a person to be perfect but in this context, I mean that the perfect leader is the one who can work together as a group, Understand their responsibilities, gather the love and trust of everyone and mainly who can make important decision for the business to exist. By stating the term of perfect leader I mean the one who can easily solve the conflict and hold everyone together. There is a picture that I think is a very best definition of how the leader should be. Also, if possible the form should adopt a democratic style of leadership

### DISCUSSION

As you can see through the graph the leaders those who are more resilient can bring a greater overall change in the business because they can quickly recover from the difficult situations. This shows as mentioned above, for the leader to be perfect they need to be more resilient they can even bring back the firm for the loss and make it reach the profit.

This Graph shows the net income of the firm one with poor leaders, good leaders and great leaders. The one with great leader close to the perfect leader shows that the better the leader, the more consistent the work and better the net income of the firm or the individual.





As this graph clearly depicts that the democratic style of leadership can be perfectly fit in any firm if used properly which means if the firm has democratic style of leadership can increase the efficiency of the business as it increases the relationship within the firm, used to resolve conflicts which is main objective

### CONCLUSION

The main conclusion that we come to an is for the for the positive impact of the leadership an democratic style of leadership should be used within a firm so that all the negative impact of having a leader can be tackled. Also, If the firm has a perfect leader than the firm would undoubtedly have an effective and productive output.

### Acknowledgements

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## DIGITAL MARKETING: THE GAME CHANGER FOR SMALL SCALE INDUSTRIES (SSI)

**Palaash Jadav**

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### Abstract

This paper aims to prove or disprove the hypothesis: 'Digital marketing provides companies within the small-scale industries an equal opportunity to market their products and services and compete effectively with companies within the large-scale industries'. This research paper studies how Flipkart, a company which is now a Unicorn, leveraged social media to rise through the ranks.

**Keywords:** "digital marketing", "flipkart.com", "digital channels", "re-target", "metrics", "internet penetration"

### INTRODUCTION

#### **Key phrases explained**

**Digital marketing:** Digital marketing refers to the usage of digital channels like websites, social media apps, etc. to market services and products to reach consumers. Digital marketing helps enterprises approach consumers, understand their activity and behaviour and track metrics significantly better than before as data from digital platforms is easily accessible to these companies.

**Search Engine Optimization (SEO):** SEO is the act of enhancing the quality and quantity of website traffic to a website or a web page from search engines by increasing the website ranking using certain keywords on the website.

**Return on Investment (ROI):** It is the profit resulting from deploying a digital marketing campaign expressed in percentage. Expressed as: Profit from an increase in sales divided by investment in digital marketing  $\times 100$ .

**Dynamic Entertaining Advertisements:** These are banners that change or adapt automatically to promotions and content specifically for a particular user. This makes sure that each user is exposed to the most effective creative or 'dynamic' entertaining advertisement for him or her.

**Unicorn Company:** A company that reaches a valuation of \$1 billion without being listed on the stock market is considered a Unicorn.

**Internet Penetration:** The part of the population that can access the Internet. This is measured by the percentage of internet users in any country (India).

**Digital Marketing Metrics:** Digital Marketing Metrics are values that marketing teams use to track and measure the performance of a digital marketing campaign. Digital marketing teams use multiple platforms and tools to promote their product or service offering, and the results which are tracked are termed 'metrics'.

### **The objective of this paper:**

Companies within the small-scale industry do not have the financial resources to advertise using traditional marketing channels. However, digital marketing and its pervasiveness have levelled the playing field thus providing the companies with a sizeable return on their marketing investment as compared to traditional means of marketing.

That is because of the following factors:

#### **1. Increased internet penetration due to an increase in the use of mobile phones:**

In 2020, 53 percent of India's total population accessed the internet and various applications from their mobile devices. It is expected to grow to 96 percent by 2040, indicating a significant rise in the country's mobile internet user base. [1] So, it is easier to utilize dynamic entertaining advertisements to reach the target audience through digital marketing compared to traditional modes of marketing like; outdoor billboard advertisements, and print advertisements, to name a few.

#### **2. Ease in reaching the target audience and tracking marketing metrics:**

Not only is it true that more people can be reached using digital marketing, but digital marketing by its nature also allows small businesses to analyze user interaction based on crucial factors like gender, age, interests, and location, accordingly, place ads thus increasing the possibility of conversion of prospects to customers at a lower cost of acquisition. Companies can continue to study the target audience's interaction pattern using data analytics and proceed to nudge them towards a purchase.

#### **3. Low investment, high ROI compared to traditional marketing**

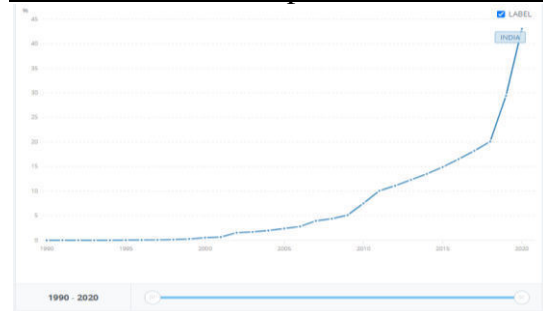
As compared to traditional marketing, the cost per lead using digital marketing is 61% less expensive. Digital marketing provides the option to the businesses to only pay when the viewer clicks the advertisements and reach only the desired demographic thus reducing the overall costs. This method is a significant improvement over carpet bombing ads using the traditional channels like television, outdoor advertising, etc. where it is relatively difficult to measure the impact of a marketing campaign on the revenue.

## **RESULT**

### **Flipkart- Case study**

Flipkart's initial investment was reportedly USD 6000, or INR 4 lakhs and it made a record of INR 1.4 crores in a single day in 2016. [2] A large portion of Flipkart's success can be attributed to its digital marketing strategy.

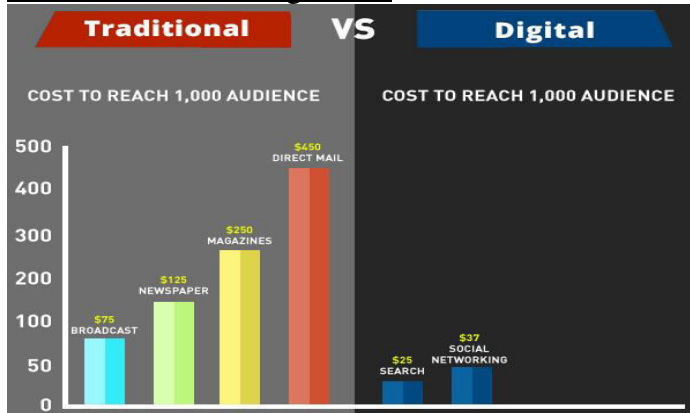
#### **1. Growth of internet penetration and SEO usage:**



**Fig.1** Growth of internet penetration in India (percentage) [3]

Flipkart was able to increase its reach using digital channels as the number of people accessing the internet from their mobile devices has increased significantly as can be seen above. By using SEO techniques, Flipkart was also able to improve its rank on Google's search pages thus bringing unpaid traffic to the website as opposed to direct and paid traffic.

### 2. Low investment, high ROI:



**Fig.2** Traditional vs Digital marketing spend to reach 1000 people[4]

As can be seen in the graph above, the total cost of reaching 1000 people using traditional marketing channels is USD 900 as against USD 62 for digital marketing which is 93% cheaper.

### 3. Re-targeting

Flipkart uses 3rd party platforms to run ads and advertise on different websites, majorly to remarket to those customers who add products to their carts or wish list. After a user clicks on Flipkart's google ads, they are re-targeted by Flipkart across social media platforms using the Facebook Pixel via ads.

### 4. Metrics tracking:

Digital media marketing helps companies use tools to measure various metrics to track customer engagement, retention, and acquisition. Flipkart uses multiple free tools, like Google Analytics, that help it measure the effectiveness of their digital marketing and advertising efforts. Flipkart uses a virtual command centre or TCoE (Testing Centre of Excellence) that uses a standardized testing methodology. This helps companies reassess their marketing strategy and put out tailored content which led to a better conversion ratio.

### 5. Social Media:

When it comes to Instagram, Flipkart has various accounts for different uses, accounts dedicated to lifestyle and tech. One of the key highlights is that Flipkart has a separate account which focuses on just Customer Stories called 'FlipkartStories'. Flipkart invests heavily in digital collaborations with celebrities because when the celebrities post the collaboration on their account, the followers of the celebrity are also exposed to the unique campaigns and products launched by Flipkart. Flipkart pays special attention to Twitter, it follows a fixed pattern of communication for other platforms but for Twitter, they keep launching mini campaigns using creative hashtags like #BigBillionDays, #SareeTwitter.



### CONCLUSION

The future of digital marketing:

While currently, the focus is on apps like Instagram, Facebook, etc. Digital marketing experts believe that emerging technologies like augmented reality, virtual reality, and voice search will play a significant role in the future of marketing and set eCommerce-enabled businesses on a new path. Voice search continues to gain more popularity whether it is Cortana, Siri, Alexa or google assistant. This enables the optimization of keywords and phrases or SEO and makes it more realistic and practical.

We conclude through discussion and secondary research that digital marketing helps small businesses connect with their customer base at a lower cost as compared to companies within large-scale industries. Whether you are a small business offering local goods and services or looking for a way to reach consumers on a limited budget, digital marketing can help you compete effectively in the market.

### Acknowledgements

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### SMALL SCALE INDUSTRIES-A GATEWAY TO OPPORTUNITIES

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#### **Abstract**

Small scale industries refer to those small entrepreneurs who are engaged in production, manufacturing or service at a small scale. Small scale industries play a focal role in the economic and social development of India in the post-independence era. The contribution of Small Scale Industries to the Indian economy in terms of employment generation, reducing regional imbalances, promoting inter-sectorial linkages and magnifying exports has been excellent. This sector through more than 5000 products ranging from traditional to high-tech. The Small Scale Industries can take India's economy from 2 trillion dollar to 20 trillion dollar faster than large scale industries.

**Keywords:** Small scale industries, Economy and MSME

#### **Introduction**

In the year of 2020 many small scale industries faced tremendous loss and very many people lost their jobs but in the annual year of 2021-2022 the Indian economy has shown considerable growth performance by contributing to create livelihood opportunities to millions of people and in increasing the overall economic growth of the country. The sector of small scale industries comprises almost about 80% of the total industrial units in the country. In India small scale industries occupy 36 million units, contribute to 45% of industrial production, 40% to the export sector through more than 5000 products ranging from traditional to high-tech and provides employment to about 80 million people. Therefore the small scale industries in a developing country like India occupy a special place in the industrial structure. In view of the potential of small scale industries, the government has given this sector an important place in the framework of Indian economic planning for economic reasons.

#### **Theory**

A small scale industry is an industrial undertaking in which the investment under fixed assets in plant and machinery or equipment, whether held on ownership term or on lease or hire purchase, does not exceed ₹ 10 crore for manufacturing enterprise and ₹ 5 crore for service enterprise. However, the investment limit changes overtime as prescribed by the government.

In accordance with the provision of Micro, Small & Medium Enterprises Development (MSMED) Act, 2006 the Micro, Small and Medium Enterprises (MSME) are classified in two classes:

1. Manufacturing Enterprises: The enterprises engaged in the manufacturing or production of goods pertaining to any industry specified in the first schedule to the industries (Development and regulation) Act 1951 or employing plant and machinery in the process of



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value addition to the final product having a distinct name or character or use. The Manufacturing Enterprise are defined in terms of investment in Plant and Machinery.

2. Service Enterprises: The enterprises engaged in providing or rendering of services and are defined in terms of investment in equipment.

Industrial units are generally classified as small, medium and large scale units considering their size, capital invested and the number of human resource employed. The concept of small business has been defined by different countries in different ways, however the definition changes over time.

The small scale industries in India whether in manufacturing sector or service sector are split up into five parts:

1. Manufacturing industries: These units are producing merchantable articles for direct consumption and also for processing industries, example: khadi industries, food processing industries, power looms, etc.
2. Ancillary industries: The ancillary industries produce parts and components for large industries.
3. Service industries: Service industries are known for covering all light repairs shop that is essential to maintain mechanical equipment. These industries completely depend on machinery.
4. Feeder industries: These industries produce certain specialised products like electroplating, casting, welding, etc.
5. Mining or Quarries: These industries caters the demand of different types of stones and minerals of the Indian and foreign market.

### Results

Small scale industries are important because it helps in increasing employment and economic development of India. It improves the growth of the country by increasing urban and rural growth. Role of Small and medium scale enterprises are to help the government in increasing infrastructures and manufacturing industries, reducing issues like pollution, slums, poverty, and many development acts. Small scale manufacturing industries and cottage industries play a very important role in the economic development of India.

### Conclusion

The furtherance and advancement of small scale industries is essential for the development of Indian economy to achieve impartial distribution of income and wealth, economic self-dependence and economic sustainable developments. Some appropriate measures to be taken by the government in providing financial assistance at minimum formalities, a platform to be built by government to help the MSMEs in procurement of quality raw material and train them for organised marketing process.

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## DIGITAL MARKETING: SMALL SCALE INDUSTRIES VS LARGE SCALE INDUSTRIES

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### Abstract

The main objective of this research paper is to brief and elaborates the new form of marketing the “Digital Marketing” which is becoming more common due to the increase in use of internet from 1990. This type of marketing is a step closer to globalization and has helped many industries to grow. This paper will enhance more about the small scale industries and large scale industries and expands about the benefits,opportunities, global online reach, costs and effective targeting these industries can have by using this type of marketing.

**Keywords:** *products, internet, costs, Marketingstrategies, firms, digital.*



### Introduction

Due to the growth of digital media and digital platforms it has made this type of marketing the most dynamic form of marketing. Many firms who used to follow traditional marketing have started changing to adapt more of digital media into them as it has a big importance at present.

Digital marketing is a key to many solutions, traditional marketing has been more expensive than digital marketing, many small scale industries have been facing problems in targeting and sub segmenting the market which causes a huge loss to these firms. Not only small scale industries but also large scale industries face problems due to traditional marketing it is very difficult for them to change or edit their advertisements if there are any faults in their product.

The main objective of this paper will be to understand the importance of digital marketing in different firms and for the use of this research paper one should have fundamentals of marketing and ICT.



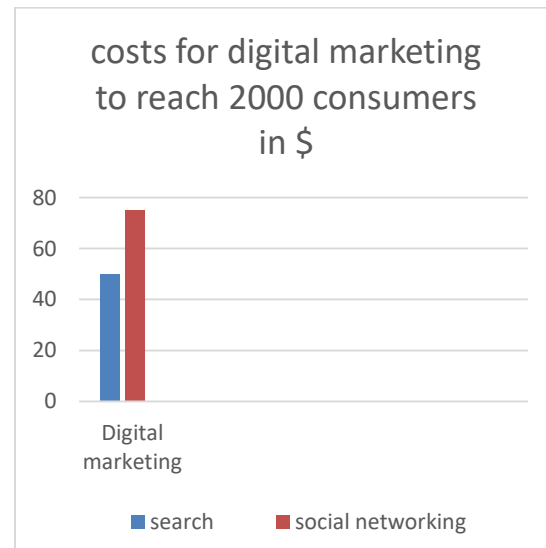
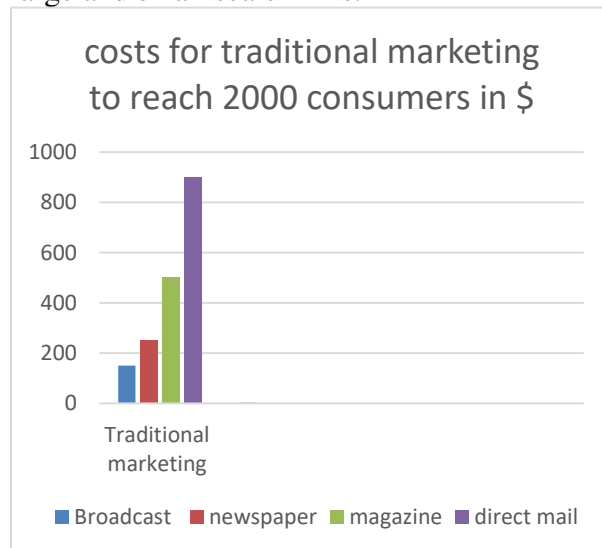


### Theory

In India the digital marketing can be seen from 2005 when the internet had started to boom and the evolution of digital marketing in India started to grow. A great example can be firms like TCS, Infosys and Wipro who have built deeper consumer relationships by giving personalized digital experiences. There are many other large scale and small scale industries who have grown a lot with the help of digital marketing, a great example can be amazon a firm who has grown in the past few years by targeting the exact market and showcasing ads through variety of digital platforms. This type of marketing is easy to start and has a global reach. Many firms find it easy to analyse and firms gain instant feedback which helps them improve their products easily. This not only helps the firms but also for the consumers as by one click they can check and compare the products and prices and order anything from anywhere they want.

### Discussion

Due to digital marketing it has been very easy for the firms especially for the firms who are small scaled to conduct marketing experiments and strategies. Due to the ease of internet firms can easily reach consumers through paid ads or set up campaigns on google, LinkedIn, twitter ect.and show their products or services when consumers search for terms related to it. Emails are also a great example for digital marketing which is a very useful method of marketing for both large and small scale firms.



As you can see that how cheap and effective it is for these firms to reach and advertise their products through digital marketing as compared to traditional marketing which helps a lot to the small scale firms to save higher costs getting spent on marketing rather they can spend it on their products RND.

### Conclusion

Digital marketing is a must nowadays for building a successful business. These many digital benefits can help improve your firm to be best at it can be by understanding what's coming



ahead in the space of digital transformation, firms who take advantage of growing online can be very successful and ahead of their competitors.

### Acknowledgement

I would like to acknowledge all the firms, industries and the start-ups who are running day and night for the consumers by bringing unique and innovative products/services in the market to bring a change in the society therefore I would like to dedicate my work to them.

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## CONTRIBUTION OF COMPUTATIONAL SYSTEMS, MODELLING AND SIMULATION IN CARDIOVASCULAR DISEASES

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### Abstract

Cardiovascular diseases (CVD) are disorders of the heart and blood vessels. They include coronary heart disease (CHD), peripheral arterial disease, and rheumatic heart disease, to name a few. The complexities of these diseases are rapidly exceeding. Thus, modern technology like computational systems, modeling and simulation are used to aid in the understanding of such diseases. This paper will analyze how these new ways contribute to the diagnosis and treatment of cardiovascular diseases (CVDs).

**Keywords:** *computational systems, modelling, simulation, cardiovascular disease*

### INTRODUCTION

An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. [1] Figuring out the age group which is most vulnerable to CVDs and making sure they get proper treatments is essential to avoid untimely death. Technologies like computational systems, modeling and simulation promise to pave the way to more personalized treatments for patients. Computational systems are systems that process information and display an output. Modeling involves making a representation of something, which helps in visualizing a hypothetical situation. Computational medicine aims to improve healthcare by making computational models of disease, personalizing these models using data from patients, and working on these models before to improve the diagnosis and treatment of the disease. [2] Simulation is an artificial model with a particular set of conditions in order to experience something that is possible in reality. This allows us to get a better grasp on hypothetical yet possible situations in the future. Aviation and aerospace industries have been using simulation as a teaching tool for many years. Simulators are now widely used in education and training in a variety of high risk professions and disciplines, including the military, commercial airlines, nuclear power plants, business and medicine. Recently, the inclusion of clinical skills training into the curricula of medical students has seen significant growth, through this experimental learning. [3]

### Theory

With precision medicine emerging as the future for cardiology, the diagnostic and therapeutic assessment of patients with cardiac disease increasingly relies on advanced imaging technology,

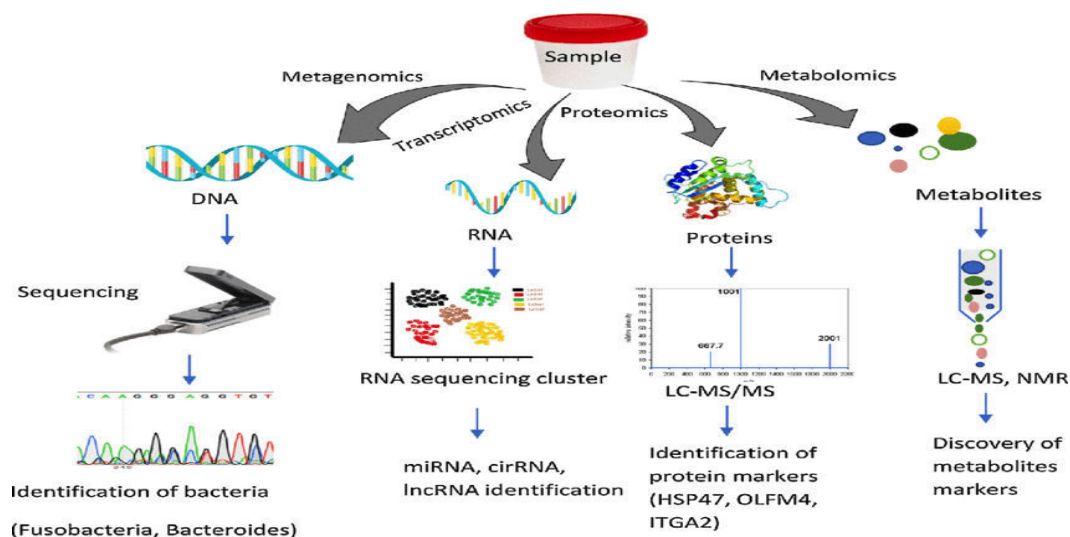
genetic profiling, pharmaceuticals, medical devices and upcoming technology like computational models, the omics technique, and simulation. [4]

### Computer simulations:

The use of computer simulations can be applied in a controlled and systematic manner to evaluate diverse interventions for reducing cardiovascular disease risks. Due to technological advancements, shortened training hours, and the increasing complexity of healthcare, simulation in Cardiology is rapidly expanding. In a risk-free environment, simulation enhances procedural competency and human factors training to improve patient safety. The use of simulation can be beneficial to novice trainees, experienced clinicians (e.g. for revalidation), and groups working together. We can test new procedures before implementing them, maintain seldom used skills, and assist underperforming doctors. A cardiovascular simulation provides doctors with critical information about the functioning of a patient's cardiovascular system as well as the most appropriate treatment strategy. Doctors can only get a limited amount of information about the fluid flow through a patient's heart or vessels from an MRI or CT scan. As a result, there is a lot of “guesswork” involved in treating patients with cardiovascular problems. With limited information, doctors will assess the situation and predict how the body will react to various treatment options. The problem with this approach is that it does not accurately capture the complexity of the human body and the diversity of the human population. By providing doctors with additional information specific to the patient, cardiovascular simulation addresses this issue and enables doctors to design more effective treatment plans.[5]

### Omics techniques:

As cardiovascular diseases are complex states, influenced by both genetics and the environment, they require an investigation of many biological levels to understand. Omics techniques generate very large, complex and non-linear datasets, which mandate a systems biology approach, that is, the understanding of a biological process through examining the interactions between heterogeneous components. By using this technique, the doctor can reveal the complex characteristics of the disease, enabling them to make more informed decisions. [6]





This image shows the different types of omics that are extracted by a sample given by the patient, which are then sequenced. Different sorts of revelations can take place after the sequencing. Moreover, as this is at the genetic stage, more information will be revealed to the doctor about the disease, and how it is affecting the body.

### **Computational model:**

A computational model uses computer programs to study complex systems using an algorithmic or mechanistic approach and is widely used in a diverse range of fields spanning from physics, chemistry and biology to economics, psychology, cognitive science and computer science. Among computational models of the various physiological systems, the heart is the most highly advanced example of a virtual organ, capable of integrating data at multiple scales, from genes to the whole organ. [7] The personalised interactive nature of such a virtual-patient simulation adds value to the existing clinical workflow by offering more quantitative and objective insight in the underlying disease cause of a patient. In addition, the model provides a platform for virtual evaluation and trial and improvement on the computational model for better therapy. [8]

### **CONCLUSION**

The use of computer models in cardiology may become the new quantitative method for detecting and treating cardiac diseases thanks to their ability to provide rapid, low-risk, and low-cost diagnosis based on the physiology and pathology of patients without subjective assessment. New clinical developments and personalization of cardiac care will be driven by the discipline of computational cardiology in the future, as it grows and develops. By integrating "omic" strategies, we will be able to identify novel molecular mechanisms that contribute to CVD faster and more precisely. Eventually, this may lead to the identification of new pathways or drug targets. Although understanding the interactions between different omics data requires increasingly complex concepts and methods, we argue that hypothesis-driven investigations and independent validation must still accompany these novel systems biology approaches to realize their full potential. Simulation is rapidly becoming a mainstay of cardiovascular education, training, certification, and the safe adoption of new technology. If cardiovascular medicine is to continue to lead in the adoption and integration of simulation, then, it must take a proactive position in the development of metric-based simulation curriculum, adoption of proficiency benchmarking definitions, and then resolve to commit resources so as to continue to lead this revolution in physician training.

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### ROLE OF MILITARY COMMUNICATION IN EMPOWERING DEFENSE SYSTEM OF A COUNTRY

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#### Abstract

This research paper goes over how military communication technologies have evolved throughout time and how they aid in fortifying a country's defense system. This research paper also goes over implementation of military communications in WW1 and WW2, and after. The research paper highlights how requirements for communication increased as time went on.

**Keywords:** mobile radio, communication, radiotelegraphy, radiotelephony, JTRS (joint tactical radio system)

#### Introduction

Any effective military action has always required a clear and compact interchange of information, and none more so than in current times. All facets of combat were rapidly mechanized in the early twentieth century. On the battlefield, the substitution of horsepower with internal combustion engines, as well as more effective armament, resulted in significant changes. Soldiers would no longer battle shoulder to shoulder, and commanders would no longer be able to see the action up close. As a result of these developments, having a good communication system has become even more important. The evolution of these methods of communication has rapidly helped in reinforcing a country's military might and defense.

#### Theory

Beginning of WW1, both the sides were in access of, to a limited degree, modern means of signal communication but were not in realization of the load it would place on the communication systems to be in charge of the massive forces of the Allies (Western Europe, The United States, Soviet Union) and the Central Powers. In terms of structure and efficiency, armies were vastly different.

On one hand, Great Britain possessed a small but well-developed signal service, whereas Russia's signal service was inferior to the Union Army's at the end of the American Civil War. It was apparent to both the sides that the commanders were incapable of managing and directing huge fleets of modern army without signal communication that was efficient enough. This had led to errors from each of the sides: 1) a forced halt to the German offensive north of the Marne, and a subsequent retreat. 2) the Russian forces' failure in East Prussia, which culminated in a catastrophic loss at the hands of General Paul von Hindenburg in the Battle of Tannenberg, was largely owing to a near-total lack of signal communication. Field telephones and switchboards were developed quickly, and those that were already in use were upgraded. A complicated telephone system with thousands of lines exists on both sides. Pole lines with several crossarms and circuits arose in the rear of the opposing troops, and buried cables and wires were inserted in the elaborate trench systems leading to the front lines. Lateral cable lines roughly parallel to the

front crossed the main arteries travelling from the rear to the forward trenches. Engineers of the belligerent nations soon developed portable radios with batteries, using low aerials. The predominant unreliability and need of encoding made them auxiliary to wire systems and last resort for when wires get cut. For conveying predetermined signals, pyrotechnics, rockets, Very pistols, and flares were often used. Messenger services expanded to the point that they were used with motorcycles, bicycles, and cars. The employment of homing pigeons as one-way messengers from the front to the back was widespread, and they performed admirably. Dogs were regularly utilized as messengers, and their effectiveness in the German army was great.

The introduction of planes in WW1 heavily complicated communication as air to ground communication were rarely ever put to use. The pilot had to land or drop messages to make his reports, and he received instructions from strips of white and black fabric called "panels" put out in an open field according to planned patterns while in the air. Between the aircraft and ground headquarters, extensive attempts were made to employ radiotelegraph and radiotelephone. Many planes were fitted with radios in the last months of the war, but the service was never acceptable or dependable, and thus had little impact on military operations. Wireless telegraph system was deployed and thoroughly used as well; it used ship and shore communications over long distances. By 1938, mobile radio instruments had also been developed by Germany to aid ground and air forces.

Between the periods of WW1 and WW2, frequency-modulated (FM) radio had been developed by a major in the U.S. Army Signal Corps during World War I, Edwin H. Armstrong. FM offered the reduction of ignition and unnecessary noises heard when using radio in vehicles. On the eve of World War II, all nations used military signaling in a similar manner. Foot, horseback, motorbike, vehicle, aeroplane, homing pigeon, and messenger dog were among the messenger methods. Flags, lights, panels for signalling aeroplanes, and fireworks were among the visual agencies. Wire systems for telephone and telegraph service, including the printing telegraph, were welcomed by the electrical agencies. Radiotelegraphy and radiotelephony were widely used, but radiotelephony had not yet shown to be dependable and sufficient for tactical military communication. The world's navy began World War II with highly developed radio communication systems, both telegraph and telephone, and several electronic navigational aids in the works. The blinker-light system was still in operation. On navy boats, the usage of telephone systems and loud-speaking voice amplifiers had also becoming widely used. Air forces used cable and radio transmission to connect their bases and landing fields, and built airborne long-, medium-, and short-range radio equipment for air-to-ground and air-to-air communication. SCR – 300 mobile radios were put under use.

The need for communications and radio has surpassed their capacity after WWII. The communications–electronics industry's research and development reached unprecedented heights, and manufacturing capacity had to be expanded. High-powered mobile radio systems were popular at the division and regimental levels. With these

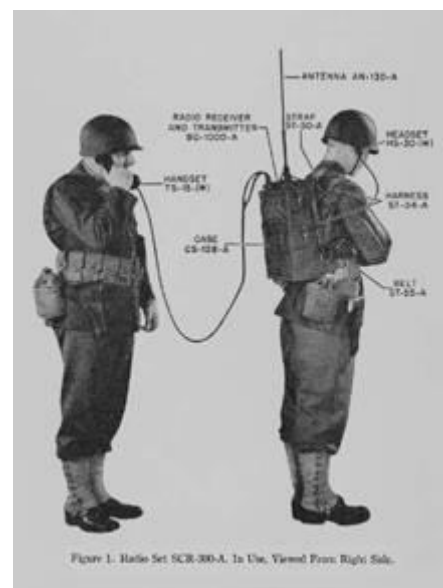


Figure 1. Radio Set SCR-300-A. In Use. Viewed From Right Side.





devices, telegraph transmission may be carried out across lengths of more than 160 kilometers with vehicles in regular road traffic. There were constructed and utilized sets that used frequency modulation and carrier techniques, as well as radio relay sets that used radar pulse transmission and reception techniques and multiplex time-division methods to acquire several voice channels from a single radio carrier. A radio teletypewriter relaying system was devised, allowing a radio teletypewriter operator in Washington, London, or other capitals to send messages by teleprinter to the commander in any theatre of combat. A system of torn-tape relay centers was also devised so that tributaries may send messages through the major centres and retransmit them swiftly by shifting a perforated tape message from the receiving to the sending places. A technique for hosting teletypewriter conferences was also created. These "telecons" allowed a commander or his staff at each end to examine incoming teletypewriter communications on a screen as quickly as the characters were received. [1]

### **Rifleman radio**

The Rifleman Radio is a small, durable portable radio that uses the Soldier Radio Waveform to transmit speech and data (SRW). The Rifleman Radio is a self-contained router that does not rely on established infrastructures like mobile phone towers or line-of-sight communications. Soldiers may speak with anybody on the network and transfer data up and down the chain, as well as into the Warfighter Information Network-Tactical network backbone (WIN-T). The Rifleman Radio may also be linked to the Nett Warrior, an Android-based smartphone that allows Soldiers to exchange messages, access mission-related apps, and use GPS technology to monitor one another's movements. Leaders can also use digital communications to track Soldiers' locations and give protection in hostile situations. This enables large squadron forces to move in synchronization and plan better offensive and defensive attacks and counter-attacks[2]

### **JTRS (joint tactical radio system)**

The JTRS is based on the Software Communications Architecture (SCA), an open-architecture framework that instructs designers on how to integrate hardware and software. It regulates the JTRS' structure and function, allowing programmable radios to load waveforms, run programs, and be networked into a system. Every hardware set must have a Core Framework, which provides a common operating environment. Because the same waveform software may be simply transferred to various radios, interoperability across radio sets is improved.

The full collection of radio and/or communications operations that occur from user input to radio frequency output and vice versa is referred to as a waveform. Waveform Application Code, Radio Set Devices, and Radio System Applications make up the JTRS waveform implementation. Initially, there were 32 JTRS waveforms which are now down to the following 9:

- Wideband Networking Waveform (WNW)
- Soldier Radio Waveform (SRW)
- Joint Airborne Networking?Tactical Edge (JAN-TE)
- Mobile User Objective System (MUOS)
- SINCGARS
- Link-16
- EPLRS



- Â· High Frequency (HF)
- Â· UHF SATCOM

### CONCLUSION

The evolution of military communication has heavily impacted the capability and effectiveness of an army on a battlefield. Developments such as mobile radio, FM radio and JTRS have proved major roles and aided large forces such as allied and central powers. Without communication, the large forces would prove difficult to control and co-ordinate.

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