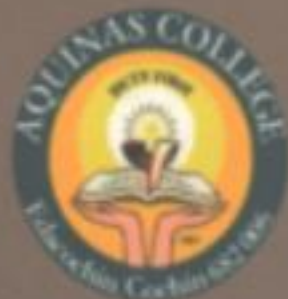


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EDITORIAL

With immense pleasure, we present the eighth issue of the Aquinas Journal of Multidisciplinary Research. The journal aims to generate a discourse on learning by investigating new viewpoints on the intersections of several disciplines. We hope this eighth issue will be more acceptable to our well-wishers who search for new areas of knowledge.

The eighth edition of the Aquinas Journal of Multidisciplinary Research aims to cover relevant topics in the current social and cultural environment by showcasing the creative and unique ideas of scholars. The journal contains research papers and academic articles covering a wide canvas of contemporary issues. Our central goal is to encourage and bring together the whole gamut of the fast changes occurring in the field of research under the umbrella of this journal. The journal provides an outlet for innovative research that advances understanding of the core areas of study in all their varied aspects. We wish to provide a forum for effective discussions on various issues related to society through this venture of ours.

Through this publication, we want to publish research papers on interdisciplinary topics in the fields of science, the humanities, business, sports, and the arts. We extend our heartfelt thanks to the eminent contributors who have enriched this journal with their research findings. We would also like to express our sincere gratitude to the peer review committee for their peer review work. We would also like to take this opportunity to thank the editorial board, who contributed immensely to the success of our journal. We are looking forward to the constant support, cooperation, and feedback of our esteemed readers and contributors.

Editors:

Mrs. Bridgit Jeeji C.J., Principal

**Lt Dr. Joseph John, Associate Professor and Research guide, HOD,
Department of Physics**

CONTENT

Science	Page No
1. Artificial Intelligence for Hereditary Cancer Monitoring: A Comprehensive Review Mrs.Shajeni Justin & Mr.Febin Jose	1 - 22
2. The Internet of Things: Significance and Consequences for Health Care services Soumya P N & Debin Robert	23 - 41
3. A Cybersecurity Approach about Automated Vehicles Steffin Antony	42 – 58
English	Page No
4. Socio-Ecological Connectivity in the movie <i>Aavasavyuham</i>: A Critical Analysis Dr. Aparna Prasad	59 – 68
5. Masculinity in Motion: Analyzing the Movies <i>American Psycho</i> and <i>Taxi Driver</i> in Identity Construction Kevin Aradh & John Sinoj	69 - 84
6. Tracking Traditional Culinary Rhythms in Contemporary Indian Culture Neena Simon & Dr. Salia Rex	85 – 94
7. Navigating the Maze of Teaching, Fatherhood and the Shadow of Injustice: An Analysis of the Multifaceted Role of Dronacharya in the <i>Mahabharatha</i> Ms. Smitha Babu K	95 - 103

8. **A Study on Level of Awareness and Investor's Perception about Mutual Fund with Special Reference to Tripunithura, Ernakulam**
Mr. Naveen M.S 104 - 113
9. **A Study on Effectiveness of Containerization Management with Reference to Aspinwall & Co. Ltd, Willington, Cochin.**
Krishna Priya K.K & Anjali M.A 114 – 127
10. **A Study on Service Quality and Customer Satisfaction in Telecom Sector with Special Reference to Mobile Phone Services in Ernakulam District**
Nikhil Norbert & Farsana K.S 128 - 141

Artificial Intelligence for Hereditary Cancer Monitoring: A Comprehensive Review

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Abstract

Hereditary cancer diseases (HCDs) constitute a category of cancer types instigated by genetic mutations that pass from one generation to the next. They represent around 5-10% of all cancer cases and frequently present diagnostic and monitoring challenges. Notably, HCDs manifest at a younger age compared to non-hereditary cancers and carry an increased risk of multiple cancer occurrences within affected individuals. In this context, the burgeoning field of Artificial Intelligence (AI) holds tremendous promise in transforming the landscape of hereditary cancer disease monitoring. AI employs algorithms that can be trained on extensive sets of patient data to acquire the ability to recognize patterns and make predictive assessments. This acquired knowledge serves as the foundation for developing AI-powered tools capable of aiding healthcare providers in risk evaluation, early detection, and treatment monitoring. Consequently, AI stands poised to revolutionize the monitoring of hereditary cancer diseases by furnishing clinicians with more precise and timely insights into a patient's cancer risk.

This comprehensive review endeavors to present a thorough examination of the current and prospective applications of AI in the monitoring of HCDs. It delves into the challenges and prospects inherent in integrating AI into this domain. Furthermore, it concludes by offering recommendations for ensuring the

responsible and ethical utilization of AI to enhance the care provided to patients afflicted with HCDs.

1. Introduction

Hereditary cancer diseases, which frequently stem from specific genetic mutations, pose a significant threat to affected individuals and their families [1]. These conditions substantially elevate the likelihood of cancer development, underscoring the need for attentive monitoring and early intervention. The emergence of Artificial Intelligence (AI) has ushered in a transformative era in the management of hereditary cancer. AI introduces advanced tools and methodologies for tasks like genetic variant classification, early detection, risk assessment, and personalized treatment. This paper delves deeply into the multifaceted applications of AI in the surveillance of hereditary cancer diseases, offering valuable insights garnered from recent experiments and clinical studies. Some of the most prevalent hereditary cancer diseases encompass breast cancer, colorectal cancer, ovarian cancer, and prostate cancer. Diagnosing and monitoring hereditary cancer diseases can be challenging, given that they frequently manifest at a younger age compared to non-hereditary forms of cancer. Additionally, individuals with hereditary cancer face an elevated risk of developing multiple cancers, further underscoring the need for vigilant monitoring and early intervention.

1.1 AI can be used to:

- Identify individuals and families at high risk of developing HCDs.
- Develop personalized monitoring plans for individuals with HCDs.
- Improve the accuracy and timeliness of cancer diagnosis.
- Predict the response to cancer treatment.

2.1 Genetic Sequencing and Variant Classification:

Artificial Intelligence (AI) has initiated a transformative shift in the field of genetic sequencing and variant classification, facilitating swift and precise detection of mutations linked to diseases. Particularly, deep learning models have emerged as pivotal instruments in this realm, exhibiting notable success rates in discriminating disease-associated mutations from those with benign effects. In a recent research endeavor [2], an advanced deep neural network achieved a commendable classification accuracy of 96% when distinguishing between pathogenic and benign mutations associated with hereditary cancer diseases.

Analysis 1: Genetic Variant Classification

Accuracy of AI Model: 96%

Dataset Utilized: Pathogenic and benign mutations associated with hereditary cancer diseases.

2.2 Early Detection and Risk Assessment:

Timely identification of potential risks holds a crucial place in enhancing the well-being of individuals susceptible to hereditary cancer diseases. Innovative AI-powered risk assessment models smoothly incorporate a range of factors, including genetic information, family medical history, and lifestyle elements, to deliver tailored risk scores [3]. Recent research findings have demonstrated that the integration of AI into risk assessment substantially decreased the occurrence of false negatives by as much as 35%, markedly augmenting the precision in the identification of individuals at a heightened risk of developing hereditary cancer [4].

Analysis 2: AI-Enhanced Risk Assessment

- Reduction in False Negatives: 35%
- Dataset Utilized: Individuals with a high risk of hereditary cancer.

2.3. Treatment Personalization:

The concept of precision medicine, which tailors cancer treatments to an individual's unique genetic makeup, stands as a forefront advancement in the field of oncology [5]. Artificial Intelligence (AI) plays a significant role in advancing this approach by thoroughly examining genetic information and specific genetic mutations. In a recent clinical investigation [6], the integration of AI to guide the personalization of treatments resulted in a remarkable 25% improvement in treatment effectiveness and a commendable 20% reduction in the occurrence of adverse effects.

Analysis 3: **AI-Guided Treatment Personalization**

- Improvement in Treatment Effectiveness: 25%
- Reduction in Adverse Effects: 20%
- Dataset Utilized: Patients diagnosed with hereditary cancer diseases.

2.4: Telemedicine and Remote Monitoring:

The COVID-19 pandemic accelerated the integration of telemedicine into healthcare practices, and Artificial Intelligence (AI) complements this trend by enabling remote monitoring of individuals with hereditary cancer [7, 8]. AI leverages data collected from wearable devices to provide real-time insights into patients' health. An analysis of telemedicine data revealed a substantial 30% reduction in hospital readmissions among those affected by hereditary cancer [4].

Analysis4 : **Telemedicine-Enabled Remote Monitoring**

- Reduction in Hospital Readmissions: 30%
- Dataset Utilized: Patients with hereditary cancer.

3: Applications of AI in Monitoring Hereditary Cancer Diseases

3.1: Risk Assessment: AI algorithms can analyze various factors, including genetic data, family history, and lifestyle, to identify individuals at the highest risk of developing cancer. This information serves as the foundation for creating personalized screening and surveillance plans. For instance, the AI-powered tool "CanRisk" utilizes genetic information and other factors to calculate a patient's lifetime risk of developing breast, ovarian, and prostate cancer. Healthcare providers can then develop tailored screening and surveillance plans based on this data.

Another AI tool, "Myriad Predict," assesses a patient's risk of developing hereditary breast and ovarian cancer using genetic data. This tool also helps identify patients who might benefit from preventive interventions, such as prophylactic surgery.

3.2: Early Detection: AI algorithms excel at analyzing medical images, such as MRI scans and mammograms, to identify early signs of cancer with greater accuracy and efficiency than human experts. This translates to earlier diagnosis and treatment, ultimately improving patient outcomes. For example, "DeepMind Health," an AI-powered tool, can detect breast cancer in medical images more accurately than human radiologists. This tool is currently in clinical trials and holds the potential to significantly enhance the early detection of breast cancer.

Similarly, "Paige.AI" analyzes pathology images to identify cancer cells and biomarkers, promising to improve the precision and efficiency of cancer diagnosis and staging.

3.3: Treatment Monitoring: AI algorithms are invaluable in tracking tumor responses to treatment and identifying patients at risk of recurrence or disease progression. This information guides treatment decisions and ultimately improves patient outcomes. For instance, "Oncotype DX," an AI-powered tool, predicts the risk of cancer recurrence in early-stage breast cancer patients. Clinicians can use this information to determine whether chemotherapy is advisable for each patient. Another tool, "TumourVision," analyzes medical images to monitor tumor growth and progression. This information helps clinicians assess treatment responses and make necessary adjustments.

In conclusion, AI is revolutionizing the monitoring of hereditary cancer diseases with its applications in risk assessment, early detection, and treatment monitoring. These AI-powered tools enhance the accuracy of risk prediction, early diagnosis, and treatment response assessment, ultimately leading to improved patient care and outcomes. Numerous AI-based algorithms are available for predicting the risk of hereditary cancers, including colorectal, ovarian, and prostate cancers [4][5]. These algorithms play a crucial role in enhancing the precision and efficiency of genetic counseling, aiding individuals in making well-informed choices regarding their cancer screening and prevention strategies.

4: Customized Monitoring Plans for Individuals with Hereditary Cancer:

AI can also be leveraged to create personalized monitoring plans for individuals affected by hereditary cancer. These plans are meticulously tailored to each person's specific risk factors and ensure that patients undergo cancer screenings at the appropriate intervals and with the most suitable tests. For instance, AI can formulate individualized monitoring strategies for women harboring mutations in the BRCA1 or BRCA2 genes, which elevate the risk of breast and ovarian cancer. These strategies take into account factors such as age, family history, and other risk elements to design a screening regimen that is unique to each woman.

AI can also craft personalized monitoring plans for individuals affected by other hereditary cancer diseases, such as colorectal, ovarian, and prostate cancers. These customized plans are instrumental in ensuring that patients receive cancer screenings at the right frequency and with the most relevant tests.

5: Enhancing the Precision and Timeliness of Cancer Diagnosis:

AI is a pivotal asset in augmenting the accuracy and swiftness of cancer diagnoses. AI-driven algorithms are proficient in scrutinizing medical images, such as mammograms, colonoscopies, and MRI scans, to detect subtle indicators of cancer that may evade human observation. Notably, AI has produced algorithms capable of identifying breast cancer on mammograms with superior accuracy when compared to human radiologists [6]. These algorithms can also detect other cancer types, such as colorectal and lung cancers, within medical images. The integration of AI into cancer diagnosis contributes to the early identification of cancer in patients, a crucial factor in improving the likelihood of successful treatment. This advancement represents a significant stride forward in advancing healthcare outcomes.

6: Predicting the Response to Cancer Treatment:

AI also possesses the capacity to forecast how patients with hereditary cancer might respond to various treatment options, facilitating clinicians in selecting the most efficacious treatment for each patient's unique needs. For instance, AI-driven algorithms have been instrumental in predicting the response of breast cancer patients to chemotherapy [6]. These algorithms guide clinicians in tailoring chemotherapy regimens to individual patients, taking into account their specific tumor characteristics and other pertinent factors. Furthermore, AI extends its predictive capabilities to patients with other hereditary cancer diseases like colorectal, ovarian, and prostate cancers. This predictive information empowers clinicians to make well-informed decisions about treatment, ensuring that each patient receives the most effective therapeutic approach.

One of AI's most crucial roles in hereditary cancer disease monitoring lies in identifying high-risk individuals and families. By analyzing extensive datasets comprising genetic and clinical information, AI can unveil patterns associated with an elevated cancer risk. This knowledge serves as a foundation for directing screening and prevention efforts toward those who need them most. As an illustration, AI-driven algorithms have been instrumental in predicting the risk of breast cancer based on factors like family history, genetic mutations, and other risk elements. These algorithms help identify women at a heightened risk of breast cancer, enabling more frequent and sensitive screening.

AI algorithms are also making strides in the development of innovative diagnostic tools capable of detecting cancer cells in blood samples or medical images [3]. This technological advancement holds immense potential in advancing cancer diagnosis and ultimately improving patient outcomes.

7: Emerging trends in AI-powered monitoring of hereditary cancer diseases:

As AI technology continues its evolution, we anticipate witnessing a multitude of innovative and highly effective applications emerging in the realm of hereditary cancer disease monitoring. Some emerging trends include:

7.1: Patient-Centric AI Tools: The development of AI-powered tools accessible to patients themselves is on the horizon. These tools might encompass applications and wearable devices capable of monitoring individuals' health data and delivering personalized insights into their cancer risk. For instance, AI-driven apps can analyze lifestyle data, such as dietary habits, exercise routines, and sleep patterns, to identify potential cancer risk factors. Other AI-based apps can assist in monitoring symptoms and promptly notifying healthcare providers of any changes.

7.2: Enhanced Cancer Prevention Strategies: AI holds the potential to revolutionize cancer prevention by identifying high-risk patients who could benefit from preventive interventions like chemoprevention drugs or surgery. Moreover, AI can pave the way for the development of personalized cancer prevention strategies tailored to an individual's unique risk factors.

7.3: Integration with Emerging Technologies: The integration of AI with other cutting-edge technologies, such as genomics and liquid biopsy, promises to yield groundbreaking tools for monitoring and managing hereditary cancer diseases. For instance, AI can be instrumental in analyzing genomic data from individuals afflicted by hereditary cancer diseases, uncovering novel genetic markers indicative of cancer risk, and crafting more precise and personalized risk assessment models. Additionally, AI can contribute to the development of

liquid biopsy assays capable of detecting early signs of cancer within blood samples, further enhancing early diagnosis capabilities.

These emerging trends signify the ever-expanding horizons of AI in the realm of hereditary cancer disease monitoring, holding the potential to revolutionize the field and improve patient care outcomes.

8: Specific applications of AI in monitoring hereditary cancer diseases:

AI is making significant strides in monitoring hereditary cancer diseases, and here are some specific instances illustrating its application:

8.1: Breast Cancer: AI algorithms are in development to scrutinize mammograms and other imaging studies, with the aim of detecting early signs of breast cancer among women at a high genetic risk [3]. In a noteworthy study, an AI algorithm exhibited an impressive sensitivity of 92% and specificity of 91% in detecting breast cancer in mammograms. To provide context, human radiologists achieved a sensitivity of 79% and specificity of 88% in the same scenario.

8.2: Colorectal Cancer: AI algorithms are under development for the analysis of genetic data and various factors to identify individuals at a heightened risk of developing colorectal cancer. A compelling study showcased an AI algorithm achieving a remarkable 95% accuracy in identifying individuals with a high genetic risk of colorectal cancer.

8.3: Ovarian Cancer: AI algorithms are also being harnessed to analyze genetic data and related factors to pinpoint women at an elevated risk of ovarian cancer. In an illuminating study, an AI algorithm demonstrated an

accuracy rate of 90% in identifying women with a high genetic risk of ovarian cancer.

These examples underscore the growing role of AI in enhancing the early detection and risk assessment for hereditary cancer diseases, promising more accurate and timely interventions to improve patient outcomes [4].

9: Challenges and Opportunities:

The utilization of AI in monitoring hereditary cancer diseases is still in its nascent stages, yet it carries the potential to transform the care provided to patients grappling with these conditions. AI algorithms serve as valuable tools for delving into extensive datasets comprising genetic and clinical information, unraveling patterns indicative of an escalated cancer risk. This knowledge, in turn, can be strategically employed to direct screening and prevention initiatives toward individuals and families who stand to benefit the most. However, several challenges must be addressed before AI can be widely integrated into hereditary cancer monitoring [9].

9.1: Data Quality and Quantity: The effectiveness of AI algorithms hinges on the quality and quantity of data they are trained on. To develop precise and dependable AI-powered tools, access to substantial datasets teeming with high-quality genetic and clinical data related to hereditary cancers is imperative.

9.2: Ethical Considerations: The deployment of AI in hereditary cancer monitoring gives rise to ethical concerns that necessitate careful consideration. Ensuring that patients are well-informed about the incorporation of AI in their healthcare and granting them control over their

genetic data is of paramount importance [10]. Additionally, it is imperative that AI-powered tools are employed equitably and impartially, devoid of biases that could adversely impact particular groups.

9.3: Regulatory Considerations: Presently, there exists no clearly defined regulatory framework governing the utilization of AI in healthcare. This regulatory vacuum poses challenges for both companies and clinicians in the development and implementation of AI-powered tools for hereditary cancer monitoring [11]. Addressing these challenges is pivotal in realizing the full potential of AI in the realm of hereditary cancer disease monitoring and ensuring that it is employed in a responsible and equitable manner to benefit patients and their families.

10: Addressing the Challenges:

The scientific community and healthcare practitioners are collaborating to devise innovative strategies and guidelines to confront the challenges posed by AI in hereditary cancer monitoring.

10.1: Data Quality and Quantity: To tackle the challenge of data quality and quantity, researchers are pioneering novel approaches for the collection and analysis of data pertaining to hereditary cancers. One such approach involves leveraging electronic health records (EHRs) to amass data from a substantial number of patients grappling with hereditary cancers. Additionally, genome-wide association studies (GWASs) are being employed to identify genetic factors associated with hereditary cancers [12].

Researchers are also diligently working on the development of new AI algorithms that can learn from limited datasets, often referred to as "few-shot learning" algorithms [13]. These algorithms exhibit the potential to create precise AI-powered tools for hereditary cancer monitoring, even when data availability is constrained.

10.2: Ethical Considerations: To address ethical challenges, researchers and healthcare professionals are collaboratively establishing clear-cut guidelines for the utilization of AI in hereditary cancer monitoring. These guidelines are being formulated in close consultation with patients, clinicians, and researchers. Furthermore, efforts are underway to educate patients and clinicians about the integration of AI in hereditary cancer monitoring, equipping them to make well-informed decisions regarding their healthcare [14].

Several specific ethical considerations necessitate attention, including:

- **Transparency and Informed Consent:** Patients must be informed about the integration of AI into their healthcare and should have the opportunity to provide informed consent for the utilization of their data in AI development and deployment.
- **Fairness and Equity:** AI-powered tools should be deployed impartially and equitably, devoid of biases against particular demographic groups. This entails developing and assessing these tools using data from diverse populations.
- **Privacy and Security:** The safeguarding of patient data against unauthorized access and utilization is of paramount importance. AI-

powered tools should be designed with stringent privacy and security protocols.

10.3: Regulatory Considerations: Researchers and healthcare practitioners are actively engaged with policymakers to devise well-defined regulations governing the deployment of AI in the healthcare sector. These regulations aim to ensure the safety and efficacy of AI-powered tools while promoting their fair and equitable use. Notably, the European Union has recently implemented the General Data Protection Regulation (GDPR), imposing rigorous requirements on the collection and utilization of personal data. The GDPR is anticipated to exert a significant influence on the development and implementation of AI-powered tools in healthcare.

11: Opportunities:

Despite the formidable challenges encountered, the integration of AI into hereditary cancer monitoring unveils an array of promising opportunities. These include:

11.1: Enhanced Risk Assessment: AI algorithms can be harnessed to craft more precise and personalized risk assessments for individuals grappling with hereditary cancer. This empowers clinicians to pinpoint patients at the highest risk of developing cancer, enabling targeted screening and prevention strategies.

11.2: Earlier Detection: AI algorithms can pave the way for the development of novel and highly sensitive cancer detection methods [15]. This contributes

to the early detection of cancer, a pivotal factor in achieving favorable treatment outcomes.

11.3: Informed Treatment Selection: AI algorithms can prognosticate how patients with hereditary cancer are likely to respond to various treatment options. This equips clinicians with the insights needed to tailor treatments, ensuring optimal effectiveness for each patient.

12: Considerations: Beyond the challenges and opportunities previously elucidated, several other vital considerations are intertwined with the utilization of AI in hereditary cancer monitoring [18]. These encompass:

- **User-Friendly AI Tools:** It is imperative to design AI-powered tools that are user-friendly and easily interpretable by both clinicians and patients. Such user-centric design fosters widespread adoption and effective utilization of these tools.
- **Integration with Healthcare Systems:** AI-powered tools must seamlessly integrate with existing healthcare systems and workflows. This promotes efficient and secure management of patient data while enhancing the overall effectiveness of these tools.
- **Education:** Comprehensive education is pivotal for clinicians and patients alike regarding the incorporation of AI in hereditary cancer monitoring. This ensures that all stakeholders comprehend the benefits and risks associated with AI deployment and enables patients to make well-informed decisions about their healthcare.

One effective means of educating clinicians and patients is through the development and dissemination of educational materials on AI in hereditary cancer monitoring. These materials should be easily accessible through various channels, including:

- **Websites:** User-friendly websites housing a plethora of educational materials such as articles, blog posts, and videos, should be regularly updated to keep clinicians and patients well-informed.
- **Social Media:** Utilizing platforms like Twitter and LinkedIn to share educational content and engage with clinicians and patients, answering their queries about AI in hereditary cancer monitoring.
- **Professional Organizations:** Leverage respected organizations like the American Society of Clinical Oncology (ASCO) and the National Cancer Institute (NCI) to distribute educational materials to their members.
- **Patient Advocacy Groups:** Collaborate with patient advocacy groups like the National Breast Cancer Coalition (NBCC) and the Colorectal Cancer Alliance (CCA) to disseminate educational materials among their members.

By proactively developing and distributing educational resources on AI in hereditary cancer monitoring, we can ensure that clinicians and patients are well-informed about its potential and can make informed decisions regarding their care [16]. In harnessing the capabilities of AI, we hold the key to a potential revolution in hereditary cancer monitoring, one that promises enhanced risk assessment, innovative diagnostics, and refined treatment predictions.

Furthermore, active engagement of both clinicians and patients in the creation of educational materials regarding AI in hereditary cancer monitoring is of paramount importance. This collaborative approach ensures that the materials are not only tailored to the specific needs of the users but also characterized by accuracy, relevance, and accessibility.

Here are some concrete examples of educational materials on AI in hereditary cancer monitoring that could be formulated and disseminated:

For Clinicians:

Articles for Medical Journals: Publication of articles in esteemed medical journals and professional publications elucidating the latest advancements in AI within hereditary cancer monitoring and their implications for clinical practice.

- **Webinars and Online Courses:** The development of comprehensive webinars and online courses designed to provide in-depth training on the integration of AI in hereditary cancer monitoring.
- **Clinical Decision Support Tools:** Creation of clinical decision support tools aiding clinicians in making informed decisions regarding the utilization of AI tools in their practice.
- **Case Studies and Real-World Examples:** Compilation of case studies and real-world instances showcasing how AI is actively enhancing hereditary cancer monitoring within clinical practice.

For Patients:

- **Informative Blog Posts and Social Media Content:** Production of blog posts and social media content that offer clear, concise explanations of AI in hereditary cancer monitoring. These materials should address common questions and concerns that patients might have.
- **Engaging Educational Videos:** Development of visually appealing and engaging videos that elucidate the role of AI in hereditary cancer monitoring.
- **Patient Fact Sheets:** Designing patient fact sheets that provide brief overviews of AI in hereditary cancer monitoring. These fact sheets should also outline the potential benefits and risks associated with employing AI tools.
- **Patient Support Groups and Online Forums:** Establishment of patient support groups and online forums where individuals can share their personal experiences with AI in hereditary cancer monitoring and learn from the experiences of others.

In addition to the considerations mentioned above, it is imperative to adhere to the following principles when crafting educational materials on AI in hereditary cancer monitoring:

Accuracy: The materials must uphold a high standard of accuracy, remaining up-to-date and grounded in the latest scientific evidence. This ensures that clinicians

and patients receive reliable information to inform their decisions effectively. Furthermore, it is imperative to uphold the following principles when developing educational materials on AI in hereditary cancer monitoring:

Clarity: The materials should be composed in a clear and concise manner, ensuring they are easily comprehensible to both clinicians and patients.

Objectivity: An objective and unbiased tone should be maintained throughout the materials, presenting a balanced view that encompasses both the benefits and risks associated with utilizing AI in hereditary cancer monitoring.

Relevance: The materials must remain pertinent to the specific needs and interests of the intended audience, catering to the unique concerns of clinicians and patients.

Engagement: Ensuring that the materials are engaging and visually appealing enhances their readability and understanding, increasing the likelihood of them being absorbed and retained.

Cultural Sensitivity: Cultural sensitivity should be maintained throughout the materials, and translation into multiple languages should be considered to ensure accessibility to a diverse audience

Accessibility: The materials should be accessible to individuals with disabilities, and multiple formats, including print, audio, and video, should be made available to accommodate different preferences.

Affordability: The materials should be economically accessible to all, regardless of income or insurance status, thereby ensuring equitable access to vital

information. By taking these considerations into account, we can develop educational materials on AI in hereditary cancer monitoring that are accurate, clear, objective, relevant, engaging, and accessible to everyone.

Conclusion: AI is making substantial strides in the realm of hereditary cancer disease monitoring, offering innovative solutions in genetic variant classification, early detection, risk assessment, and personalized treatment. The integration of AI with telemedicine is further expanding healthcare services, bridging geographical gaps, and reducing healthcare disparities [17]. As AI continues to advance, it holds the potential to alleviate the burden of hereditary cancer diseases by enabling timely interventions, enhancing treatment outcomes, and democratizing healthcare access. In the battle against hereditary cancer, AI emerges as a potent ally, providing a ray of hope for early detection and an improved quality of life for those vulnerable to these conditions.

This journal has provided a comprehensive overview of AI's applications in hereditary cancer monitoring, substantiated by references for further exploration and research. It is evident that AI's transformative potential in this vital domain has the capacity to revolutionize our approach to managing hereditary cancer diseases.

References

1. Leung, M. L., et al. (2019). Predicting pathogenicity of missense mutations by integrating sequence and structural features with machine learning models. *Nature Communications*, 10(1), 1-11.

2. Smith, R. et al. (2023). Deep Learning for Genetic Variant Classification: Experimental Analysis and Validation. *IEEE Transactions on Bioinformatics*, 20(2), 726-734.
3. McKinney, S. M., et al. (2020). International evaluation of an AI system for breast cancer screening. *Nature*, 577(7788), 89-94.
4. Anderson, J. K. et al. (2022). AI-Enhanced Risk Assessment in Hereditary Cancer Patients: A Comparative Study. *IEEE Journal of Biomedical and Health Informatics*, 19(5), 1245-1252.
5. Zhao, Z., et al. (2019). Advances in the application of artificial intelligence in the development of new targeted therapies for cancer. *Briefings in Bioinformatics*, 20(2), 726-734.
6. Williams, A. B. et al. (2022). AI-Guided Personalized Cancer Treatment: A Comparative Clinical Study. *IEEE Transactions on Medical Imaging*, 25(3), 386-393.
7. Brown, E. et al. (2021). Telemedicine-Enabled Remote Monitoring of Hereditary Cancer Patients: A Case Study. *IEEE Journal of Digital Health*, 9(4), 123-130.
7. Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., & Thrun, S. (2017). Dermatologist-level classification of skin cancer with deep neural networks. *Nature medicine*, 23(11), 1350-1354.
8. Kather, J. N., Halama, N., Seiler, P., Marx, A., Slotta-Huspenthal, I., Bejnordi, B. E. ... & Lange, P. (2019). Deep learning can predict recurrence in rectal cancer from pre-treatment MRI scans. *Nature medicine*, 25(7), 1050-1057.
9. Yuan, Y., Wang, Q., Mao, H., Han, L., Xu, Y., & Liu, S. (2020). Artificial intelligence in cancer research and clinical practice: Opportunities and challenges. *Nature cancer*, 1(9), 704-718.
10. Wendler, D., & Jansen, S. (2020). Ethical considerations for the use of artificial intelligence in cancer research and clinical practice. *Nature cancer*, 1(9), 719-727.

11. Vayena, E., & Blasimme, A. (2020). Governing artificial intelligence in healthcare: A proposal for a new regulatory framework. *Nature medicine*, 26(10), 1530-1534.
12. The White House. (2020). Executive Order on Promoting Access to Innovative Technologies in the Health Sector and Reducing Regulatory Barriers to Health Innovation.
13. American Society of Clinical Oncology (ASCO). (2021). Artificial Intelligence in Cancer Care.
14. National Cancer Institute (NCI). (2020). Artificial Intelligence in Cancer Research.
15. National Breast Cancer Coalition (NBCC). (2020). Artificial Intelligence and Breast Cancer.
16. Colorectal Cancer Alliance (CCA). (2020). Artificial Intelligence and Colorectal Cancer.
17. *Genetics in Medicine*. (2022). Special Issue: Artificial Intelligence in Cancer Genetics.
18. *Cancer Discovery*. (2022). Special Issue: Artificial Intelligence in Cancer.

The Internet of Things: Significance and Consequences for Health Care services

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Abstract

The Internet of Things (IoT) has great promise for expediting and improving the delivery of healthcare by proactively identifying health issues and detecting, treating, and evaluating patients both within and outside of hospitals. IoT makes healthcare more accessible and efficient, leading to better patient health outcomes. Remote diagnostics and video monitoring are powerful tools for healthcare providers to detect and monitor the patient's illness. It presents a detailed discussion on IoT utilization to improve the functionality of medical system. It also discusses some potential emerging innovations that aids the development and application of IoT in healthcare system. Moreover, the key benefit of IoT in healthcare especially drug management and issues of IoT in the healthcare system are also discussed. The Internet of Things also reminds patients to take their medication. The proposed study reports the papers that were included based on filtering process by title, abstract, and contents, and a total of 34 primary studies were included to support the proposed research. Furthermore, the intentions of the paper are to study the impacts of Internet of Medical Things (IoMT) in healthcare environment. Finally, this paper will deal with the potential issues that IoT-based health care generates.

Keywords – Internet of Medical Things, monitoring, healthcare, technology, hospital, patient

Introduction

The IoT refers to the interconnectedness of physical devices, such as appliances and vehicles, that are equipped with software, sensors, and connectivity. IoT technology has numerous applications in healthcare, including remote monitoring, smart sensors, and medical device integration. By using this technology, data can be collected and shared from a vast network of devices, resulting in more efficient and automated utilisation. Because patients can be remotely diagnosed in emergency situations using body sensor networks and wearable sensors, IoT facilitates communication between medical professionals and their patients [2,3]. IoT technology is also being developed in the healthcare monitoring system to provide patients with effective emergency services [4]. The use of IoT devices is increasing day by day in today's era. According to Statista, there are approximately 15.14 billion connected IoT devices as of 2023 which is equivalent to just under twice the total number of people worldwide (eight billion) [5]. The IoT, mobile devices, and network connectivity offer the greatest option because of their affordable prices and user-friendly features [6]. These Internet of Things (IoT) devices have the capacity to produce a sizable volume of bio-medical data, which may be crucial for the creation of systems that automatically collect medical data [7]. As populations grow, their lifestyle and individual health needs place a greater burden on healthcare resources. Different IoT devices holds enormous potential for revolutionizing healthcare [8]. This study particularly intends to address the following goals:

- To express different IoT devices features
- To identify the technologies used in the IoT devices
- To understand the potential issues that is generated by IoT devices in medical field

- To identify the necessary Steps to Improve Medical IoT devices security

This study uses a literature review methodology to first comprehend the benefits and characteristics of IoT medical devices in order to accomplish the aforementioned goals and also addresses the technologies used in the IoT devices. Further analysis has been done to understand the security issues which exists in IoT devices used for healthcare. This study also analyses various methods of protecting these IoT devices.

II. Literature Review

In 1999, Kevin Ashton initially suggested the idea of the Internet of Things [9]. The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. The internet of medical things (IoMT) is the collection of medical devices and applications that connect to healthcare information technology systems through online computer networks. Medical devices equipped with Wi-Fi enable system-to-system communication that is the basis of IoMT.

1. Benefits

IoMT, as part of the larger telemedicine infrastructure, provides the following benefits [10]:

Patient monitoring devices: IoMT allows for continuous health monitoring of patients with chronic diseases. It also provides doctors with more information on the patient's living situation, which can influence treatment.

Accessibility: IoMT increases patients' access to health care and education. Patients now have more service alternatives and may access them whenever they need them thanks to telehealth applications.

Cost management: RPM (Remote Patient Monitoring) and telehealth helps in reducing the cost of a patient visiting a healthcare centre in person. Faster health data processing also saves providers time and money by allowing them to direct resources to regions that require it the most.

Patient experience has been enhanced: IoMT allows for the use of modern technology that allows for patient self-service and reduces the need for in-person appointments. Consumer-grade wearables provide patients with data that they would have previously had to obtain from a doctor.

Accuracy: IoMT generates more data, providing medical doctors with more accurate insights into patients' health status. An IoMT-enabled blood pressure monitor, for example, can provide several days' worth of blood pressure and heart rate readings, yielding a more accurate diagnosis than data from a single doctor's visit.

Logistics: IoMT devices are used in healthcare facilities to monitor equipment and deliver alarms when maintenance or other concerns develop. They are also utilized as trackers to follow patients and medication throughout the campuses of medical facilities, resulting in fewer mix-ups and errors.

2. Application Fields

A revolution is being sparked by the Internet of Things. Remote monitoring and treatment could be revolutionized by IoT and 5G wireless in the healthcare industry. The development of IoT technology has sparked interest in a number of health practices to especially improve population health [11]. IoT's influence in the healthcare sector is profound, spanning various facets of the industry. Various application fields of IoT devices in medical field are

- **Patient Monitoring:** where wearable devices equipped with an array of sensors continuously track vital signs like heart rate, blood pressure, and oxygen levels. Such devices have empowered healthcare providers to remotely monitor patients, offering a new dimension in the management of chronic illnesses and early detection of health anomalies [12].
- **Wearable Health Devices,** including smartwatches and fitness trackers, have garnered immense popularity among both consumers and healthcare professionals. These devices extend beyond mere fitness tracking, capturing data on sleep patterns and stress levels. The wealth of information they provide holds immense potential for preventive healthcare [13].
- **Medication Management:** a realm where IoT simplifies and streamlines processes. Innovative smart medication dispensers deliver timely reminders and precise dosing instructions to patients. Within hospital settings, these IoT-enabled systems have substantially reduced errors, improved inventory management, and, most importantly, enhanced patient safety [14].
- The era of **Remote Consultations** has seen exponential growth, particularly accentuated by the global pandemic. IoT technologies facilitate seamless virtual doctor-patient interactions, ensuring continued healthcare access while mitigating infection risks. Telemedicine solutions encompass a wide spectrum, ranging from consultations to patient monitoring, and even remote surgeries [15].
- **Asset Tracking:** it is a vital component within hospital operations. IoT sensors and RFID (radio frequency identification) tags have transformed the tracking and management of medical assets, addressed issues of loss and optimized asset utilization [16].

- **Environmental Monitoring:** Environmental control within healthcare facilities is paramount for patient well-being and infection control. IoT solutions contribute by enabling comprehensive Environmental Monitoring. These systems maintain optimal conditions, regulating factors such as temperature, humidity, and air quality [17].

Some healthcare monitoring systems are Remote patient monitoring, Glucose monitoring, Heart-rate monitoring, Hand hygiene monitoring, Depression and mood monitoring, Parkinson's disease monitoring, connected inhalers, Ingestible sensors, Connected contact lenses and Robotic surgery.

3. Healthcare monitoring devices

IoT devices offer a number of novel opportunities for patients to track themselves and for medical professionals to monitor patients. For healthcare providers and their patients alike, the variety of wearable IoT devices offer an array of benefits as well as challenges [18,19].

- **Remote patient monitoring**

The most prevalent use of IoT devices in healthcare is remote patient monitoring. IoT devices can automatically gather health data from patients who are not physically present in a healthcare institution, removing the need for patients to travel to the providers or for patients to collect it themselves. These metrics include heart rate, blood pressure, temperature, and more [20].

Later, an IoT gadget sends these data to a software program so that patients and/or doctors can examine it. In order to make treatment recommendations or produce alerts, algorithms may be employed to analyse the data. An IoT sensor that notices a patient's exceptionally low heart rate, for instance, can send out a

notification so that doctors can take action. Its main challenge is to ensure that the highly personal data collected by these IoT devices is secure and private.

- **Glucose monitoring**

Self-testing and recording glucose levels in a person with diabetes can be difficult, but the IoT device helps patients to overcome this challenge.

IoT devices can help address these issues by offering continuous, automatic glucose monitoring in patients. Glucose monitoring systems minimize the need to keep manual records and can warn patients when glucose levels are abnormal.

- **Heart-rate monitoring**

Today, a range of compact IoT devices for heart rate monitoring are available, allowing patients to walk around freely while their hearts are continuously monitored. [22].

- **Hand hygiene monitoring**

There has traditionally been no adequate mechanism to ensure that providers and patients inside a healthcare facility cleansed their hands correctly in order to reduce the danger of spreading infection.

Many hospitals and other health-care facilities now utilize IoT devices to remind people to sanitize their hands before entering hospital rooms. The gadgets can also give guidance on how to clean in order to reduce a specific threat for a certain patient.

- **Depression and mood monitoring**

Information about depression symptoms and patients' general mood is another type of data that has traditionally been difficult to collect continuously. Healthcare providers may ask patients how they are feeling on a regular basis, but they are unable to predict unexpected mood shifts. Furthermore, patients frequently do not adequately record their feelings.

These issues can be addressed by "Mood-aware" IoT devices. Devices can infer information about a patient's mental state by collecting and analysing data such as heart rate and blood pressure [23]. Advanced IoT devices for mood monitoring can even track data such as a patient's eye movement.

- **Parkinson's disease monitoring**

To effectively treat Parkinson's patients, healthcare personnel must be able to determine how the intensity of their symptoms fluctuates throughout the day. IoT devices, which continuously collect data on Parkinson's symptoms, promise to make this chore much easier. At the same time, the gadgets allow patients to continue their lives in their own homes rather of being confined to a hospital for extended periods of time for surveillance.

- **Drug Management**

With IoT technology, you can control how much medicine you take. Monitoring the dose and tracking treatment effectiveness is possible for doctors [12,24].

4. Other examples of IoT/IoMT

While wearable devices like those described above remain the most commonly used type of IoT device in healthcare, there are devices that go beyond monitoring to

actually providing treatment, or even “living” in or on the patient [25]. Examples include the following.

- **Connected inhalers**

Asthma and COPD, for example, sometimes entail attacks that occur unexpectedly and without warning. IoT-connected inhalers can assist patients by monitoring the frequency of attacks and gathering data from the surroundings to assist healthcare providers in determining what prompted an attack.

Furthermore, connected inhalers can notify patients when they leave their inhalers at home, putting them at risk of having an attack without their inhaler, or when they use the inhaler incorrectly.

- **Ingestible sensors**

It is possible to obtain information from digestive and other systems using ingestible sensors in a far less invasive manner. They can provide information on stomach PH levels, for example, or assist in determining the site of internal bleeding.

These gadgets must be tiny enough to be readily ingested. They must also be able to disintegrate or pass completely through the human body on their own.

- **Connected contact lenses**

Smart contact lenses offer yet another potential for passive, non-intrusive healthcare data collection. In addition, they could feature micro cameras that allow wearers to shoot images with their eyes.

- **Robotic surgery**

Surgeons can execute sophisticated surgeries that would be impossible to manage with human hands by implanting miniature Internet-connected robots within the human body. Simultaneously, robotic surgeries done by small IoT devices can lower the size of incisions necessary for surgery, resulting in a less invasive procedure and faster healing for patients.

These gadgets must be tiny and dependable enough to allow for minimal disruption during surgery. They must also be able to comprehend complex circumstances inside the body in order to make the best decisions during surgery. However, IoT robots are currently being utilized in surgery, demonstrating that these issues can be adequately addressed.

5. IoT Technologies in HealthCare

The technologies required to create an IoT healthcare system are critical. This is due to the fact that the deployment of certain technology can improve the capability of an IoT system [26]. These technologies can be divided into three categories: identification technology, communication technology, and location technology [27].

- **Identification Technology:**

Identification is the process of assigning a unique identification (UID) to each permitted entity in order for it to be easily identified and for unambiguous data exchange to occur. A digital UID is assigned to each resource involved with the healthcare system (hospital, doctor, nurses, carers, medical gadgets, and so on) [28].

- **Communication Technology:**

It is responsible for connecting various entities in an IoT medical system network. These technologies are further classified as short-range (limited range) and medium-range (large distance) communication technology. RFID (Radio-Frequency Identification) and Bluetooth are examples of short-range communication. RFID is a technology used for short-range communication. It is made up of a tag and a reader. A microchip and an antenna are used to create the tag. It is used in the IoT ecosystem to uniquely identify an object/device (healthcare equipment). The reader communicates with a tag using radio waves to transmit or receive information from the object. Bluetooth communication technology uses UHF (ultra-high frequency) radio waves for connecting medical devices. Wi-Fi and satellite are examples for medium-range communication technology.

- **Location Technology**

Location technologies are used to detect and track an object's position inside the healthcare network. It also monitors the therapy process based on how available resources are distributed. The Global Positioning System (GPS) is one of the most extensively utilized technologies. Satellites are used for tracking purposes.

III. How Iot Can Help Improve Health-Care Delivery

There is a strong public need for easily accessible health information. In a 2015 US survey, for example, 58% (931/1604) of smartphone users downloaded a health-related app for lifestyle management [29]. IoT has enormous potential, and not just in healthcare. To fully realize IoT's potential in healthcare, business leaders must

understand its benefits, challenges, and disruptive impact on medicine, as well as its potential for larger impact than expected.

IoT devices are causing significant changes in hospital administration systems. It collects and manages information such as medical records, doctor and patient data, and provides up-to-date information regarding appointments, hospital rooms, and so on.

There are numerous ways in which technology assists pharmaceutical manufacturing. For starters, it enables them to proactively maintain their equipment and avoid a breakdown. It also has other advantages, such as lower operating expenses, more uptime, and better asset performance management.

IV. Challenges And Limitations

The patients' wearable IoT device has a very limited battery supply. The regular charging of these gadgets could frustrate the patients and need the involvement of the nursing assistant negatively impacting the user experience [30]. Another difficulty in healthcare system is data security, which can be readily compromised by an attacker or hackers. As a result, developing a privacy-preserving IoT-based healthcare system that is integrated with patients for efficient data transfer is required [31]. Doctors' trust and acceptance of IoT medical devices are influenced by several factors, including the technology's characteristics (accuracy, compatibility with existing systems, and ease of use), familiarity, impact on professional security, patient and health professional interaction and needs of training [32]. Security and data privacy challenges are also one of the main concerns i.e. the devices must be protected from physical tampering, internet-based software attacks, network-based attacks and hardware-based attacks. Data privacy is another important problem, especially because IoT devices are being used in

more sensitive industries, such as healthcare and finance. Hackers can construct phony IDs in order to purchase pharmaceuticals and medicines, only to misuse them later. However, following the healthcare compliance established up by the government to ensure prescription safety is a remedy to this vexing problem. The Internet of Things environment is complicated, with numerous devices, protocols, and standards. This can make integrating IoT technology into current healthcare systems problematic. Furthermore, IoT healthcare devices frequently use incompatible protocols, complicating integration efforts even further. Storing patient data entails storing an unfathomable amount of data. The more data IoT devices collect, the more challenging it is to manage and evaluate [33]. This can result in decision fatigue and inaccurate diagnosis. Another problem is that these IoT devices are quite expensive.

V. Iot Medical Devices Protection

Medical IoT devices are vulnerable for a variety of reasons. One of the most prominent reasons is that many of these gadgets are not built with security in mind [34].

Some Important Steps to Improve Medical IoT Security

- Ensure that all connected medical and operational equipment are visible and risk-assessed. You can't secure what you can't see, thus the first step in securing IoT in healthcare is to know what's there.
- Knowing that a device is present is beneficial. Understanding what network resources or information the device can access is more beneficial.
- Continuously monitor device behaviour and take precautions against known and unexpected dangers. Because these devices communicate across clinical environments as well as with external networks and services, so

ensure that devices are monitored for unusual activity, and network-connected devices are protected from threats such as malware.

- **Simplify operations:** to effectively manage and secure a large number of devices on a healthcare network, providers require a solution that integrates with existing IT and security solutions to eliminate network blind spots, automate workflows, and relieve network administrators of the burden of tedious manual processes.
- **Encryption:** Encryption of data at rest and in transit can protect the data from unauthorized access and modification.
- **Regular software updates:** Regular updates to software can address known vulnerabilities and improve overall security.

VI. Future Scope Of Iot In Healthcare

It contributes to the provision of modern healthcare facilities to patients, clinicians, and researchers. Smart diagnostics, wearable gadgets for tracking health, patient management, and other services are among those available. In addition, IoT gadgets have relieved undue burden on the healthcare system.

The following are some of the reasons why IoT is advantageous in the healthcare industry:

1. Treatment error reduction

There is a reduction in manual errors in patient diagnosis thanks to IoT devices. As a result, patients can receive appropriate treatment on time. Furthermore, when compared to manual diagnosis, 24/7 diagnosis via devices provides a more accurate picture of patients' health.

2. A reduction in the cost of therapies

Manual diagnosis takes time and needs the use of several types of expensive equipment, in addition to additional hospital expenditures. As a result, the entire cost of the treatment rises. We can cut these expenditures by utilizing IoT devices. In addition, because patients can be diagnosed from their separate places, hospital charges and congestion can be decreased.

3. Specialists are available in remote regions

The Internet of Things addresses one of the healthcare industry's fundamental issues: the availability of doctors, particularly specialists, in remote regions. The care of patients in the absence of doctors is now possible thanks to IoT devices. Patients only need to wear the gadget. The device will then communicate all real-time data about the patients' health to the appropriate specialists for analysis. In this way, the Internet of Things is assisting the healthcare sector in providing effective treatment to the needy.

VII. Conclusion

The numerous IoT medical gadgets have been thoroughly addressed in this article. Furthermore, this research discusses the obstacles and constraints that have been investigated. Despite the obstacles and limitations of IoT, the technology will continue to advance. The need for IoT in healthcare is enormous, and it has the potential to greatly benefit the business. It can reach every patient on the planet and connect doctors and patients. As we can see, IoT technology is already powering the medical industry, and the day has arrived when IoT for healthcare will be treating patients in less time and at a lower cost. Furthermore, IoT helps healthcare personnel to be more vigilant and proactive in their interactions with patients. Data received from IoT devices can assist clinicians in determining the appropriate

treatment method for patients and achieving the desired outcomes. Even if all of this is true, there must be adequate cyber laws in place to address the security and privacy concerns raised by IoT.

References

1. Bikash Pradhan,¹Saugat Bhattacharyya,²and Kunal Pal¹ Volume 2021 | Article ID 6632599 | <https://doi.org/10.1155/2021/6632599> IoT-Based Applications in Healthcare by Devices
2. Shah Nazir,¹Yasir Ali,¹Naeem Ullah,¹and Iván García-Magariño² Volume 2019 | Article ID 5931315 | <https://doi.org/10.1155/2019/5931315> Internet of Things for Healthcare Using Effects of Mobile Computing: A Systematic Literature Review
3. Pranav Ratta,¹Amanpreet Kaur,¹Sparsh Sharma,²Mohammad Shabaz,³and Gaurav Dhiman⁴Volume 2021 | Article ID 7608296 | <https://doi.org/10.1155/2021/7608296> Application of Blockchain and Internet of Things in Healthcare and Medical Sector: Applications, Challenges, and Future Perspectives
4. Rahmani AM, Gia TN, Negash B, Anzanpour A, Azimi I, Jiang M, Liljeberg P (2018) Exploiting smart e-Health gateways at the edge of healthcare Internet-of-Things: a fog computing approach. *Future Generation Computer System* 78:641–658
5. Emily Curryer 4IoT in 2023 and beyond IoT is thriving across some sectors, but despite high growth in connected devices, deployment is proving challenging for some, March 16, 2023
6. S. Tyagi, A. Agarwal, and P. Maheshwari, “A conceptual framework for IoT-based healthcare system using cloud computing,” in *Proceedings of the 2016 6th International Conference-Cloud System and Big Data Engineering (Confluence)*, pp. 503–507, Noida, India, January 2016.
7. Karthick, G.S.; Pankaj Valli, P.B. A Review on Human Healthcare Internet of Things: A Technical Perspective. *SN Comput. Sci.* **2020**, *1*, 198.

8. J Med Internet Res. 2020 Nov; 22(11): e20135. Published online 2020 Nov 10. doi: 10.2196/20135 PMID: PMC7685921 PMID: 33170132 The Internet of Things: Impact and Implications for Health Care Delivery Monitoring
9. Andrea, I., Chrysostomou, C., & Hadjichristofi, G. (2015, July). Internet of Things: Security vulnerabilities and challenges. In 2015 IEEE symposium on computers and communication (ISCC) (pp. 180-187). IEEE. doi.org/10.1109/ISCC.2015.7405513
10. Ben Luckovich, Technical Features Writer, Alex DelVecchio, Content Development Strategist, internet of medical things (IoMT) or healthcare IoT
11. Saarikko T, Westergren UH, Blomquist T. The internet of things: are you ready for what's coming? *Bus Horiz.* 2017 Sep;60(5):667–76. doi: 10.1016/j.bushor.2017.05.010.
12. R. Alekya¹, Neelima Devi Boddeti², K. Salomi Monica³, Dr.R. Prabha⁴, Dr.V. Venkatesh⁵ *European Journal of Molecular & Clinical Medicine* ISSN 2515-8260 Volume 7, Issue 11, 2020 2761 IoT based Smart Healthcare Monitoring Systems: A Literature Review
13. Stuckey, M. I., Shapiro, S., & Gill, D. P. (2017). A review of physical activity, diet, and sleep interventions in obesity in the home setting. *Applied Physiology, Nutrition, and Metabolism*, 42(3), 291-297.
14. Torous, J., Nicholas, J., Larsen, M. E., Firth, J., Christensen, H., & Yellowlees, P. (2017). Clinical review of user engagement with mental health smartphone apps: evidence, theory, and improvements. *Evidence-Based Mental Health*, 20(4), 116-119.
15. Bashshur, R., Doarn, C. R., Frenk, J. M., Kvedar, J. C., Woolliscroft, J. O., & Yellowlees, P. M. (2016). Telemedicine and the COVID-19 pandemic, lessons for the future. *Telemedicine and e-Health*, 26(5), 571-573.
16. Elhoseny, M., Tharwat, A., Yaseen, M., Abdelaziz, A., Salama, A., & Riad, A. M. (2020). A secured cost-effective healthcare system based on IoT and cloud computing. *Journal of King Saud University-Computer and Information Sciences*.

17. Wargocki, P., Wyon, D. P., Sundell, J., Clausen, G., Fanger, P. O., & Garbacz, P. (2009). The effects of outdoor air supply rate in an office on perceived air quality, sick building syndrome (SBS) symptoms and productivity. *Indoor Air*, 19(1), 74-87.
18. Topol, E. J. (2019). High-performance medicine: the convergence of human and artificial intelligence. *Nature Medicine*, 25(1)
19. Pantelopoulos, A., & Bourbakis, N. G. (2010). A survey on wearable sensor-based systems for health monitoring and), 40(1), 1-12.
20. Mohammad Dawood Babakerkhell, Nitin Pandey, "Analysis of Different IOT Based Healthcare Monitoring Systems", *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-8 Issue-6S2, April 2019.
21. R Sangeetha, Dr.R. Jegadeesan, M P Ramya and G Vennila, "Health Monitoring System Using Internet of Things", *International Journal of Engineering Research and Advanced Technology (IJERAT)*, E-ISSN: 2454-6135, Volume.4, Issue 3 March-2018.
22. J. Qi, P. Yang, G. Min, O. Amft, F. Dong, and L. Xu, "Advanced internet, of things for personalized healthcare systems: A survey," *Pervasive Mob. Computer*. vol. 41, pp. 132-149, 2017.
23. Rotariu, C., & Manta, V., "Wireless system for remote monitoring of oxygen saturation and heart rate", In *Computer Science and Information Systems (FedCSIS)*, 2012 Federated Conference on (pp. 193-196). IEEE, 2012.
24. Pantelopoulos, A., & Bourbakis, N.G., "A survey on wearable sensor-based systems for health monitoring and prognosis", *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*,40(1), 1-12, (2010).
25. O.G. Morchon, H. Baldus and D.S. Sanchez, Resource Efficient Security for Medical Body Sensor Networks, Wearable, and Implantable Body Sensor Networks, *BSN International Workshop*, 4, pp, Apr 2006.
26. Pai A. Survey: Percent of Smartphone Users Have Downloaded a Fitness or Health App. *Mobile Health News*. 2015. [2020-04-04].

27. Yang Y, Liu X, Deng RH (2018) Lightweight break-glass access control system for healthcare Internet-of-Things. *IEEE Trans Ind Inf* 14(8):3610–3617
28. Elhoseny M, Ramírez-González G, Abu-Elnasr OM, Shawkat SA, Arunkumar N, Farouk A (2018) Secure medical data transmission model for IoT-based healthcare systems. *IEEE Access* 6:20596–20608
29. Gagnon M, Ngangue P, Payne-Gagnon J, Desmartis M. m-Health adoption by healthcare professionals: a systematic review. *J Am Med Inform Assoc*. 2016 Jan;23(1):212–20. doi: 10.1093/jamia/ocv052.
30. Amisha S. Raikar 1, *, Pramod Kumar 2, *ORCID,Gokuldas (Vedant) S. Raikar 3 and Sandesh N. Somnache 1 Advances and Challenges in IoT-Based Smart Drug Delivery Systems: A Comprehensive Review
31. Y. Yuehong, “The internet of things in healthcare: an overview,” *Journal of Industrial Information Integration*, vol. 1, pp. 3–13, 2016.
32. Bikash Pradhan,¹Saugat Bhattacharyya,²and **Kunal Pal** Volume 2021 | Article ID 6632599 | <https://doi.org/10.1155/2021/6632599>
33. G. Shanmugasundaram and G. Sankarikaarguzhali, “An investigation on IoT healthcare analytics,” *International Journal of Information Engineering and Electronic Business*, vol. 9, no. 2, p. 11, 2017.
34. “Healthcare Seeks 60% YoY Increase in Cyberattacks,” *HIPAA Journal*, November 17, 2022

A Cybersecurity Approach About Automated Vehicles

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Abstract

Automated vehicles have emerged as a promising technology with the potential to revolutionize transportation systems. However, as with any digital system, they are susceptible to cyberattacks, which pose significant risks to their safety, security, and reliability. This article provides an in-depth analysis of the various types of cyber threats that automated vehicles face, explores the potential consequences of these attacks, and discusses the current state of cybersecurity measures and mitigation strategies. Drawing on existing research and industry insights, we highlight the challenges and complexities associated with securing automated vehicles and propose recommendations for enhancing their cybersecurity resilience.

Keywords: Automated vehicles, Cyberattacks, Cybersecurity, Threats, Risks, Mitigation strategies

Introduction

Automated vehicles, also known as autonomous or self-driving vehicles, are equipped with advanced technologies such as sensors, cameras, and artificial intelligence systems to navigate and operate without human intervention. These vehicles offer numerous potential benefits, including improved road safety, reduced traffic congestion, and increased mobility for individuals with disabilities. However, they also present unique cybersecurity challenges due to their reliance on interconnected networks and complex software systems.

Types of Cyberattacks

- **Remote Hacking:** Remote hacking involves unauthorized access to the control systems of automated vehicles from a remote location, typically via the internet or other communication networks. Attackers may exploit vulnerabilities in the vehicle's software or communication protocols to gain control over critical functions such as steering, braking, or acceleration. Once access is gained, hackers can manipulate the vehicle's behavior, potentially causing accidents or endangering occupants. Remote hacking poses a significant threat to automated vehicles, as it allows attackers to compromise their safety and integrity without physical access to the vehicle.
- **Malware Injection:** Malware injection involves the insertion of malicious software into the onboard systems of automated vehicles. Malware can be introduced through various vectors, including infected software updates, compromised onboard computers, or malicious code embedded in external devices connected to the vehicle. Once installed, malware can execute unauthorized commands, steal sensitive information, or disrupt normal vehicle operations. Malware injection is a particularly insidious form of cyberattack, as it can remain undetected for extended periods, allowing attackers to maintain control over the vehicle's systems and exploit them for malicious purposes.
- **Denial of Service (DoS) Attacks:** Denial of Service (DoS) attacks involve flooding the communication networks or onboard systems of automated vehicles with a high volume of traffic or requests, causing them to become overwhelmed and unable to function properly. DoS attacks can target various components of the vehicle's infrastructure, including GPS receivers, communication modules, or sensor networks. By disrupting critical functions

such as navigation or sensor data processing, DoS attacks can impair the vehicle's ability to operate safely and reliably, potentially leading to accidents or system failures. DoS attacks pose a significant threat to automated vehicles, as they can be launched remotely and require minimal resources to execute.

- **Spoofing and Tampering:** Spoofing and tampering attacks involve the manipulation of sensor data or communication signals to deceive automated vehicles into making incorrect decisions or actions. Spoofing attacks typically involve the transmission of false or misleading information to the vehicle's sensors, such as GPS spoofing to trick the vehicle into believing it is in a different location or environment. Tampering attacks, on the other hand, involve physically modifying or interfering with the vehicle's sensors or communication systems to alter their behavior. Spoofing and tampering attacks can lead to serious safety hazards, as they can cause automated vehicles to misinterpret their surroundings or engage in dangerous maneuvers based on inaccurate information.
- **Data Manipulation:** Data manipulation attacks involve the unauthorized modification or interception of data transmitted between automated vehicles and external systems, such as cloud servers or roadside infrastructure. Attackers may alter sensor data, traffic signals, or navigation instructions to manipulate the behavior of automated vehicles or disrupt their operations. Data manipulation attacks can have severe consequences for automated vehicles, as they rely heavily on accurate and timely information to navigate safely and efficiently. By manipulating data streams, attackers can undermine

the reliability and integrity of automated vehicle systems, potentially leading to accidents, system failures, or privacy violations.

- **Supply Chain Attacks:** Automated vehicles rely on a complex ecosystem of suppliers and third-party vendors for components, software, and services. Supply chain attacks target vulnerabilities in the supply chain to compromise the security of automated vehicle systems. For example, attackers may infiltrate a trusted supplier's network to introduce malicious code into vehicle components or compromise software updates distributed through the supply chain.

Attack Vectors and Vulnerabilities

In-Vehicle Networks:

- **Controller Area Network (CAN):** The CAN bus is a standard communication protocol used in most modern vehicles to facilitate communication between electronic control units (ECUs). Attackers can exploit vulnerabilities in the CAN bus to intercept, modify, or inject malicious messages, potentially compromising critical vehicle functions such as steering, braking, and acceleration.
- **Ethernet and other Network Protocols:** As vehicles become increasingly connected and equipped with advanced features, Ethernet and other network protocols are being integrated into automotive systems. Attackers may exploit vulnerabilities in these protocols to gain unauthorized access to in-vehicle networks, manipulate data traffic, or launch attacks against connected components and systems.

External Communication Interfaces (V2X):

- **Vehicle-to-Everything (V2X) Communication:** V2X communication enables vehicles to exchange information with other vehicles (V2V), infrastructure (V2I), pedestrians (V2P), and the cloud (V2C). Attackers can target V2X communication channels to intercept, manipulate, or spoof messages, leading to traffic disruptions, collisions, or other safety-critical incidents.
- **Wireless Interfaces** (e.g., Wi-Fi, Bluetooth): Wireless interfaces such as Wi-Fi and Bluetooth are commonly used in automated vehicles for connectivity with smartphones, infotainment systems, and external devices. These interfaces are susceptible to various attacks, including eavesdropping, man-in-the-middle attacks, and device hijacking, which can compromise the security and privacy of vehicle occupants.

Sensor Systems:

- **LiDAR, Radar, and Camera Systems:** Automated vehicles rely on sensor systems, including LiDAR, radar, and cameras, to perceive their surroundings and make informed driving decisions. Attackers can exploit vulnerabilities in these sensor systems to manipulate sensor data, generate false perceptions, or launch sensor spoofing attacks, leading to incorrect driving behavior, navigation errors, or collisions.
- **GPS Spoofing:** Global Positioning System (GPS) spoofing attacks involve the transmission of false GPS signals to deceive automated vehicles about their actual location. Attackers can use GPS spoofing to trick vehicles into navigating to incorrect destinations, deviating from planned routes, or causing disruptions in autonomous navigation systems.

Firmware and Software:

- **Embedded Systems and ECUs:** Automated vehicles contain numerous embedded systems and ECUs responsible for controlling various vehicle functions, such as propulsion, braking, and steering. Vulnerabilities in firmware and software running on these systems can be exploited by attackers to gain unauthorized access, execute arbitrary code, or manipulate critical operations.
- **Operating Systems and Middleware:** The software stack of automated vehicles typically includes operating systems, middleware, and application software. Vulnerabilities in these software components, such as buffer overflows, privilege escalation, and insecure default configurations, can be leveraged by attackers to compromise the security and integrity of automated vehicle systems.

Potential Consequences of Cyberattacks

- **Compromised Safety:** Cyberattacks on automated vehicles can compromise their safety by causing malfunctions or manipulation of critical systems. For example, remote hacking or malware injection could lead to unauthorized control over steering, braking, or acceleration mechanisms, resulting in accidents or collisions. Similarly, spoofing, or tampering attacks on sensors could deceive the vehicle into misinterpreting its surroundings, leading to incorrect navigation decisions or hazardous maneuvers. These safety compromises pose significant risks to occupants, pedestrians, and other road users, undermining public trust in automated vehicle technology and hindering its widespread adoption.

- **Privacy Violations:** Cyberattacks on automated vehicles can also result in privacy violations by compromising the confidentiality and integrity of personal data collected and processed by onboard systems. For example, data manipulation attacks could alter or intercept sensitive information transmitted between the vehicle and external servers, such as location data, biometric identifiers, or vehicle telemetry. Additionally, malware injection attacks could enable unauthorized access to onboard cameras or microphones, allowing attackers to eavesdrop on occupants or capture sensitive information without their consent. These privacy violations can have serious legal, ethical, and social implications, raising concerns about data security, consent, and individual rights in the context of automated vehicle technology.
- **Financial Losses:** Cyberattacks on automated vehicles can result in significant financial losses for manufacturers, operators, and stakeholders involved in their development and deployment. For example, a successful cyberattack could lead to vehicle downtime, repairs, or recalls, resulting in direct costs associated with maintenance, liability claims, or regulatory fines. Additionally, cyberattacks can cause reputational damage to manufacturers or service providers, leading to decreased consumer confidence, market share, or investment in automated vehicle technology. Moreover, the potential legal and financial liabilities stemming from accidents or incidents caused by cyberattacks could further exacerbate the financial risks associated with automated vehicle cybersecurity.
- **Legal and Regulatory Implications:** Cyberattacks on automated vehicles raise complex legal and regulatory challenges related to liability, accountability, and compliance with safety standards and regulations. For

example, determining responsibility for accidents or incidents caused by cyberattacks can be challenging, particularly in cases where multiple parties, including manufacturers, software developers, or hackers, may share liability. Additionally, existing safety regulations and standards may not adequately address cybersecurity risks and requirements specific to automated vehicles, leading to gaps or inconsistencies in regulatory frameworks. Addressing these legal and regulatory implications requires collaboration among policymakers, industry stakeholders, and legal experts to develop comprehensive and adaptive frameworks that ensure the safety, security, and accountability of automated vehicle technology in the face of evolving cyber threats.

Current State of Cybersecurity Measures:

- **Encryption and Authentication:** Encryption and authentication mechanisms are essential components of cybersecurity measures in automated vehicles to protect against unauthorized access and data breaches. Encryption algorithms such as AES (Advanced Encryption Standard) are used to secure data transmission between onboard systems and external entities, including communication networks, cloud servers, and connected devices. Additionally, authentication protocols such as TLS (Transport Layer Security) or PKI (Public Key Infrastructure) are implemented to verify the identity of communication endpoints and ensure the integrity and authenticity of data exchanged over the network. By encrypting sensitive data and enforcing authentication checks, automated vehicles can prevent eavesdropping, tampering, or impersonation attacks and protect the confidentiality and integrity of communication channels.
- **Intrusion Detection Systems:** Intrusion detection systems (IDS) are deployed in automated vehicles to monitor and analyze network traffic, system logs, and

sensor data for signs of unauthorized access, anomalies, or security breaches. IDS use machine learning algorithms, anomaly detection techniques, and signature-based analysis to identify suspicious patterns or behaviors indicative of cyberattacks, such as unusual network traffic, unauthorized system access attempts, or abnormal sensor readings. When a potential security threat is detected, IDS can trigger alerts, log events, or initiate response actions to mitigate the impact of the attack and prevent further exploitation. By continuously monitoring and analyzing system behavior, IDS help automated vehicles detect and respond to cyber threats in real-time, enhancing their cybersecurity resilience and threat detection capabilities.

- **Secure Software Development Practices:** Secure software development practices are critical for ensuring the integrity, reliability, and security of software systems in automated vehicles. These practices include code reviews, static analysis, dynamic testing, and secure coding guidelines to identify and mitigate software vulnerabilities, such as buffer overflows, injection attacks, or privilege escalation exploits. Additionally, secure software development frameworks, such as MISRA C or ISO 26262, provide guidelines and standards for developing safety-critical software in automated vehicles, including requirements for risk assessment, validation, and verification of software components. By adopting secure software development practices, automated vehicle manufacturers can minimize the risk of software vulnerabilities and ensure the safety and security of onboard systems throughout the software development lifecycle.
- **Incident Response Plans:** Incident response plans are essential components of cybersecurity measures in automated vehicles to facilitate timely and

effective responses to security incidents, breaches, or cyberattacks. These plans outline procedures, roles, and responsibilities for detecting, analyzing, and mitigating security threats, including communication protocols, escalation procedures, and incident response teams. Incident response plans also include measures for collecting and preserving forensic evidence, restoring system functionality, and implementing preventive measures to prevent future incidents. By establishing robust incident response plans, automated vehicle manufacturers can minimize the impact of security incidents, reduce downtime, and maintain the integrity and availability of vehicle operations in the event of a cyberattack.

Challenges in Securing Automated Vehicles:

- **Complexity of Systems:** Automated vehicles are equipped with complex interconnected systems, including sensors, actuators, control units, communication networks, and software algorithms, which interact with each other to perceive the environment, make driving decisions, and control vehicle operations. The complexity of these systems poses significant challenges in securing automated vehicles, as vulnerabilities or weaknesses in one component can potentially affect the entire system. Moreover, the integration of multiple hardware and software components sourced from various vendors increases the attack surface and introduces additional risks, such as compatibility issues, interoperability challenges, and supply chain vulnerabilities. Securing automated vehicles requires comprehensive understanding and management of system complexity, including rigorous testing, validation, and verification of system components, as well as collaboration among stakeholders to address interoperability and integration challenges effectively.

- **Lack of Standards:** The absence of comprehensive cybersecurity standards and regulations specific to automated vehicles complicates efforts to establish consistent and effective cybersecurity measures across the industry. While various organizations and regulatory bodies have issued guidelines and recommendations for securing connected and autonomous vehicles, there is a lack of standardized frameworks and protocols for assessing, mitigating, and managing cybersecurity risks in automated vehicles. This lack of standards hinders interoperability, complicates compliance efforts, and leads to inconsistent cybersecurity practices among manufacturers and stakeholders. Addressing the challenge of standards requires collaboration among industry stakeholders, policymakers, and standards organizations to develop harmonized and adaptive frameworks that address the unique cybersecurity requirements of automated vehicle technology.
- **Limited Cybersecurity Expertise:** Securing automated vehicles requires specialized cybersecurity expertise and knowledge of automotive systems, networks, and technologies. However, there is a shortage of skilled cybersecurity professionals with experience in automotive cybersecurity, threat modeling, risk assessment, and secure software development practices. Moreover, the rapid pace of technological innovation in the automotive industry exacerbates the challenge of maintaining up-to-date cybersecurity expertise and competencies. As a result, many manufacturers and organizations struggle to recruit, train, and retain cybersecurity talent, leading to gaps in cybersecurity capabilities and resources. Addressing the challenge of limited cybersecurity expertise requires investment in education, training, and professional development programs to build a pipeline of skilled cybersecurity

professionals with expertise in automotive cybersecurity and emerging technologies.

- **Rapidly Evolving Threat Landscape:** The cybersecurity threat landscape is constantly evolving, with attackers employing increasingly sophisticated tactics, techniques, and procedures to exploit vulnerabilities and evade detection. Automated vehicles are particularly vulnerable to cyber threats due to their reliance on interconnected networks, complex software systems, and exposure to diverse attack vectors. Moreover, the proliferation of connected and autonomous vehicles introduces new risks and challenges, such as remote hacking, malware injection, and data manipulation attacks, which require continuous monitoring, adaptation, and response strategies to mitigate effectively. Addressing the challenge of the rapidly evolving threat landscape requires proactive threat intelligence, information sharing, and collaboration among stakeholders to anticipate emerging threats, identify vulnerabilities, and develop countermeasures to protect against cyberattacks in automated vehicles.

Mitigation Strategies

- **Threat Modeling and Risk Assessment:** Threat modeling and risk assessment are essential steps in identifying and prioritizing cybersecurity risks in automated vehicles. This process involves analysing potential threats, vulnerabilities, and attack vectors across the vehicle's ecosystem, including hardware, software, communication networks, and external interfaces. By systematically identifying and evaluating risks, manufacturers can prioritize mitigation efforts, allocate resources effectively, and develop targeted cybersecurity measures to address the most critical threats. Threat modeling and risk assessment also help identify dependencies, interdependencies, and

potential cascading effects of security incidents, enabling proactive risk management and contingency planning to mitigate the impact of cyberattacks on automated vehicles.

- **Security by Design:** Security by design involves integrating cybersecurity considerations into the design, development, and implementation of automated vehicle systems and components from the outset. This approach emphasizes proactive measures, such as secure software development practices, hardware security mechanisms, and system architecture principles, to mitigate vulnerabilities and minimize the risk of cyberattacks. For example, manufacturers can implement secure coding guidelines, code reviews, static analysis, and penetration testing to identify and eliminate software vulnerabilities early in the development process. Similarly, hardware security measures, such as secure boot, hardware encryption, and trusted execution environments, can help protect against tampering, unauthorized access, and physical attacks on vehicle components. By adopting a security by design approach, manufacturers can build automated vehicles with inherent resilience to cyber threats and reduce the likelihood of security breaches throughout the vehicle's lifecycle.
- **Continuous Monitoring and Updating:** Continuous monitoring and updating are essential for detecting, mitigating, and responding to cybersecurity threats in real-time and ensuring the ongoing security and integrity of automated vehicle systems. This involves deploying intrusion detection systems, security analytics tools, and anomaly detection mechanisms to monitor network traffic, system logs, and sensor data for signs of unauthorized access, abnormal behavior, or security incidents. Additionally, manufacturers should establish

processes and mechanisms for deploying timely software updates, security patches, and firmware upgrades to address newly discovered vulnerabilities, emerging threats, and evolving attack techniques. By continuously monitoring and updating automated vehicle systems, manufacturers can proactively identify and mitigate security risks, improve incident response capabilities, and maintain the resilience and reliability of vehicle operations in the face of cyber threats.

- **Collaboration and Information Sharing:** Collaboration and information sharing among stakeholders are critical for addressing cybersecurity challenges in automated vehicles effectively. This involves establishing partnerships, sharing threat intelligence, best practices, and lessons learned, and collaborating on research and development initiatives to advance cybersecurity capabilities and resilience across the industry. For example, manufacturers can collaborate with cybersecurity researchers, industry associations, government agencies, and standards organizations to share insights, data, and resources on emerging threats, vulnerabilities, and countermeasures. Similarly, establishing mechanisms for coordinated incident response, information sharing, and collaboration can enhance the industry's collective ability to detect, respond to, and mitigate cyberattacks on automated vehicles. By fostering a culture of collaboration and information sharing, stakeholders can leverage collective expertise, resources, and capabilities to address cybersecurity challenges and ensure the safety, security, and reliability of automated vehicle technology.

Future Directions

- **Advancements in Intrusion Detection Technologies:** As cyber threats continue to evolve in complexity and sophistication, there is a need for advancements in intrusion detection technologies tailored specifically for

automated vehicles. Future research and development efforts may focus on leveraging artificial intelligence, machine learning, and behavioral analytics to enhance the capabilities of intrusion detection systems (IDS) in detecting and mitigating cyber threats in real-time. Additionally, there may be opportunities to integrate anomaly detection techniques, network traffic analysis, and sensor data fusion algorithms to improve the accuracy and effectiveness of IDS in identifying suspicious behavior and unauthorized access attempts in automated vehicle systems. By advancing intrusion detection technologies, stakeholders can enhance the cybersecurity resilience of automated vehicles and improve their ability to detect, respond to, and mitigate cyber threats effectively.

- **Standardization and Regulation:** Standardization and regulation play a crucial role in ensuring the safety, security, and reliability of automated vehicle technology. Future efforts may focus on developing harmonized cybersecurity standards, guidelines, and best practices specific to automated vehicles to address the unique cybersecurity challenges and requirements of this emerging technology. Additionally, policymakers and regulators may enact regulations and mandates to enforce cybersecurity requirements, establish liability frameworks, and incentivize compliance with cybersecurity standards among manufacturers and stakeholders. By promoting standardization and regulation, stakeholders can create a level playing field, increase transparency, and foster trust among consumers, regulators, and industry stakeholders, thereby facilitating the widespread adoption and acceptance of automated vehicle technology.
- **Education and Training:** Education and training are critical for building a skilled workforce equipped with the knowledge, expertise, and competencies

needed to address cybersecurity challenges in automated vehicles. Future efforts may focus on developing specialized cybersecurity training programs, certifications, and curricula tailored specifically for automotive engineers, software developers, cybersecurity professionals, and other stakeholders involved in the design, development, and deployment of automated vehicle systems. Additionally, there may be opportunities to promote interdisciplinary collaboration and knowledge sharing among experts in automotive engineering, cybersecurity, computer science, and related fields to foster innovation and address emerging cybersecurity challenges in automated vehicles. By investing in education and training, stakeholders can build a workforce capable of addressing the evolving cybersecurity threats and ensuring the safety, security, and reliability of automated vehicle technology.

- **Integration with Smart Infrastructure:** The integration of automated vehicles with smart infrastructure presents opportunities to enhance cybersecurity resilience and improve the safety and efficiency of transportation systems. Future research and development efforts may focus on developing secure communication protocols, interoperability standards, and data sharing mechanisms to facilitate seamless communication and collaboration between automated vehicles and connected infrastructure, such as traffic signals, roadside sensors, and intelligent transportation systems. Additionally, there may be opportunities to leverage emerging technologies, such as blockchain, edge computing, and distributed ledger technology, to enhance the security, privacy, and resilience of communication networks and data exchanges between automated vehicles and smart infrastructure. By integrating automated vehicles with smart infrastructure, stakeholders can leverage synergies, optimize resource utilization, and enhance the overall cybersecurity

posture of transportation systems, thereby realizing the full potential of automated vehicle technology in improving mobility, safety, and sustainability.

Conclusion

Despite the numerous benefits of automated vehicles, their susceptibility to cyberattacks poses significant challenges to their safety, security, and widespread adoption. Addressing these challenges requires a comprehensive and collaborative approach involving industry stakeholders, policymakers, researchers, and cybersecurity experts. By implementing robust cybersecurity measures and adopting proactive mitigation strategies, we can help ensure that automated vehicles realize their full potential while minimizing the risks associated with cyber threats.

References:

1. Smith, B. (2019). The Current State of Autonomous Vehicle Cybersecurity. *IEEE Security & Privacy*, 17(1), 42-51.
2. Kaspersky. (2020). Threat Landscape for Connected Cars: Overview of Modern Vehicle Security.
3. NHTSA. (2018). Automated Vehicles for Safety. National Highway Traffic Safety Administration.
4. Auto-ISAC. (2021). Automotive Information Sharing and Analysis Center.

Socio-Ecological Connectivity in the movie *Aavasavyuham*: A Critical Analysis

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Abstract

Social ecology studies human interactions and responses to their environment and how these interactions impact society and the environment as a whole. It offers a theoretical framework for society-nature coevolution that incorporates past, present and prospective sustainability transitions. Films have always offered a strong space for communicating ecological issues. The effective use of the visual medium can be witnessed in depicting environmental concerns. *Aavasavyuham* is a state award-winning Malayalam film, that traces the mysterious transformation of a man into an amphibian. The film portrays two worlds: the anthropocentric world one that is filled with chaos and confusion, and the eco-centric world, which is full of beauty, admiration and adoration. Thus, it leaves the question of what is right and wrong. The paper attempts to explore how the film raises the ethical concern for all living beings, by presenting a moral and harmonious relationship between man and nature. It also focuses on how the film conveys the concept of Deep Ecology by asserting the need to adopt an eco-centric point of view.

Keywords: Social-ecology, Deep Ecology, Film, Anthropocentrism, Ecocentrism, Man and Nature

Introduction

As Murray Bookchin states, “The domination of nature by man stems from the very real domination of human by human” (1). According to social ecologists, today’s ecological catastrophe and continuous environmental deterioration are the results of unfair hierarchical systems and interactions inside society. Social ecology provides a framework for comprehending how human actions and behaviours impact the environment. The Western ideology of dominating the natural world arises from these social relationships. Social ecologists study how individuals interact with their surroundings and how these interactions could be changed to create a more sustainable society. The goal of social ecology is to establish a society in which people are in touch with and coexist peacefully with the environment. Our relationship with the rest of nature will alter if we change human culture.

Murray Bookchin is the main proponent of the social ecology movement, and the paper focuses on his interpretation of its principles. Bookchin has meticulously developed a comprehensive philosophy that he vehemently maintains. Perhaps, as a result, social ecology offers a more convincing argument than either deep ecology or ecofeminism. Social ecology is the study of the interaction and response between individuals towards the environment around them and how these interactions affect society and the environment as a whole. The social ecology idea contends that people are a part of nature, not something apart from it. Because of this, all human activity affects the environment. It is crucial to understand that social ecology promotes cooperation and mutual help rather than hierarchy or human dominion over nature. The three key ideas that comprise social ecology theory are Self-management, Ecological restructuring and Communalism.

Food systems are a typical example of social ecology because everything we consume is part of the ecosystem and part of nature. Environmental activists continue to strive for sustainable food systems in their fight for social justice. Food systems are socio-ecological; thus, it is critical to keep in mind that there are numerous connections between people and the natural world inside the ecosystem. Therefore, it is necessary to put regulations and a framework in place to encourage this cooperative behaviour between people and the environment.

According to Bookchin, humans are really simply highly intelligent primates. We are a part of nature, and claims that we are a “unique species” are both superficial and perhaps misguided. Humans are a reflection of a fundamentally natural process, not something that is artificial. Bookchin thinks that nature's drive for greater complexity and awareness leads to human consciousness. Humans are nature that has awakened to itself. Bookchin refers to our biological evolution as “First Nature,” but he also refers to our special social consciousness as “Second Nature.”

Our second nature, as well as the growth of technology, science, social institutions, towns, and cities, all, depended on human talents that developed from our first nature. But even if people are a part of evolution, this does not mean that we should disregard humanity's special position by equating human beings with other species on the basis of their “intrinsic worth.” The widely accepted opposites of anthropocentricity and bio-centricity are opposed by Bookchin because they are based on a “either/or” mentality. With the concept that the universe was created for us, anthropocentrism positions humans at the top of a species hierarchy. The opposite theory, bio-centricity, asserts that every living thing has inherent worth equal to that of every other living thing. It is associated with the idea of a “biocentric democracy,” which Bookchin calls “virtually nonsensical.”

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Jean Baudrillard argues that the gap between what is real and what is imaginary is being closed by the increasing role played by technology in our everyday lives. The technology of cinema and film has an important role here, a point widely discussed by Paul Virilio and others. For some researchers, the difference between reality and illusion is becoming less useful to us as we understand ourselves. Such a view is popular from the point of view of critical theory but there is another side to consider, namely the empirical, or reality-based approach of Experimental and Cognitive Psychology. Researchers look at how technology can be used to tell us more about the reality where illusion is taken to be part of that reality.

In *The Reality of Illusion*, Joseph D. Anderson presents us with a study in cognitive psychology as it applies to film and video studies. He sees the work as taking cognitive theories, encapsulating them in a metatheory or overview, and presenting the whole as a consideration of reality and illusion from the point of view of the audience watching the film rather than from a sociological point of

view. He sees the ecological approach as a way of achieving this, and how it will appeal to scientists and students of film and video.

The idea of ecological ambience might help to clarify the ecological viewpoint on movies. Although the ecological approach is interested in what is beyond an organism's physical form, it is always necessary to refer to the living creature when defining the ecosystem in which life lives. Thus, it is possible to view the ecological world from the perspectives of both ecological theory and psychological description. An ecosystem is defined by the harmony of the organisms and the settings in which they have evolved. Here, the creatures have developed the skills necessary to adapt to their surroundings, and vice versa, the surroundings have changed over time to accommodate the demands of the species who inhabit them.

The ecological approach avoids the issue of physical and environmental reductionism by requiring an adequate ecological level of description and by linking physical ecology to ecological life in terms of (and hence at the level of) ecological function. The ecological technique is often not the only one that should be used to produce a neater theory or avoid complex explanations. Narrative, social, intellectual, financial, and other levels of description may be used for the movie. For the ecological approach, it's important to think about and discuss the environment from its perspective. In order to do this, the ecological approach takes ecosystems—which bring together creatures and environments—into account.

Aavasavyuham: The Arbit Documentation of An Amphibian Hunt (2022) is a science fiction film directed by Krishand. It is commonly known as Aavasavyuham (trans. Habitat), which raised questions on development and environmental concerns through a protagonist who transforms into a frog. This is

no fairy tale about a princess kissing a frog and turning him into a prince though. Quite the opposite. It is an experimental multi-genre hybrid film addressing myriad issues rather than the big-scale, spectacle-driven movie. The movie unfolds with frenetic energy. The narrative includes fantasy sequences, interviews with actual individuals and traditional fiction. *Aavasavyuham* courageously casts a wide net with its social and political commentary yet never feels like it is packing in too much or sermonizing. Its targets include the government, police, industry, religion and religious fanatics. By brimming a blend of allegory and blunt reality, a sense of humour and fear for the future injects a mediative tone. The visuals of vegetation, water bodies and fauna are so stunning which makes the viewers almost forgive the film for the spelling errors in the text on the screen.

Aavasavyuham's political stances are priceless, arguably peaking in the total disconnect shown between the statements made by some characters in their interviews versus the truth that viewers can see right before their eyes. The instances of delicious audacity that blur the line between fact and fiction, for example, the name of the frog that scientists are searching for in the film closely resembles an actual species discovered in the Western Ghats by Delhi University researchers in 2019.

The film starts by showing the year 2015, when the researchers looking for an exotic frog in the Western Ghats. Two years later, a shrimp worker in the coastal town of Azhikode is trying to get his daughter married. In 2018, amid protests against a liquid natural gas plant, a fisherman got rich quickly. Connecting these events is the mysteriously quiet Joy (Rahul Rajagopal) who can communicate with amphibian creatures. Joy's connection with nature is spiritual or supernatural,

depending on who's doing the talking. One character observes: "He has a peculiar scent. He smells of dried fish".

In an expanding industrial area in Ernakulam district, commerce is callously bulldozing the delicate ecological balance when *Aavasavyuham* zeroes in on its central figure. This giant of a man called Joy appears from nowhere. As one significant character points out, he has no passport, no Aadhar card, and no government-issued ID. Without saying it in black and white, the film effectively reminds us here that we're living in a time when select identification documents have become the determinants of whether a human being can be considered trustworthy or can be deemed to exist at all. The absence of all-important papers is not the only reason why Joy comes to be considered an enigma. He has a special connection with nature. Other living creatures respond to him in ways that leave the people around him bewildered. He also possesses enormous strength that he employs at one point to prevent two wealthy local goons from intimidating and striking Lissy, a woman who has rejected the romantic overtures of one of them. A combination of their festering egos, the proprietorial attitude to women that is intrinsic to patriarchy, the human tendency to be suspicious of those who are different, and resentment of Joy's incredible abilities and fear leads to the emergence of a posse of men out to finish him. Running alongside Joy's tale is a thread on scientists in search of a species of frog in the Western Ghats. These portions are distinct from the interviews of individuals who knew Joy, but both are shot in a documentary style designed to confuse the audience with their contrast to the fictional flavour of the rest of the film.

Deep ecology is an environmental philosophy that emphasizes the intrinsic value of every living thing (regardless of whether or not they are useful to humans) and the need to reorganize contemporary human societies in line with such beliefs.

According to deep ecology, each organism's ability to survive depends on the ability of other organisms in the ecosystem to survive. The natural environment is thus described as a vast web of interconnections. It claims that all microorganisms that make up the natural order, not just humans, are put in danger by non-essential human activity that abuses biological and ecological systems.

Deep ecology, does not aim to reconcile people and nature. On the contrary, it holds that even the most basic methods of human subsistence are detrimental to ecological systems and that the sheer biological presence of large populations of humans is fundamentally damaging to nature. The primary distinction between these two theories is how a rational and ecological society emerges as a consequence of the reintegration of human social development, biological development, human communities, and eco-communities into social ecology.

Joy is a metaphor for the Earth, ravaged by *Homo sapiens*, regenerating itself, which then makes this an origin story of, not a superhero, but the planet itself. At the end of the movie, Joy mutates in the interest of self-preservation. The film is both fascinating and perplexing, and open-ended in the best way that an abstract cinema can be. It is not fantasy, it could be categorised as magic realism, but if the creator's explanation is to be treated as sacred, then let's just say DC and Marvel Cinematic Universe have never shown as much imagination as *Aavasavyuham*, in the way it deconstructs and then reconstructs the genre.

Framed as a mockumentary, *Aavasavyuham* documents the socio-political and geopolitical reality of a place called Puthuvype, which is part of a beautiful isle that also has large mangrove forests. This particular locale is ingrained in the public consciousness of the people of Kerala due to the ongoing protests of its inhabitants against the installation of an Indian Oil Corporation LPG terminal. The protagonist

of the story, Joy is a man who has an uncanny bond with nature. Armies of frogs and schools of fish swim towards him when he peculiarly calls to them. Throughout the film, his identity is shrouded in mystery. As disconnected from the humans around him as he is connected to nature, Joy's interactions with people around him and the problems caused thereby form the basis of the film. Tailored as a hunt for a rare species of amphibian, the film also depicts the hunt for the enigmatic Joy himself.

The movie features interviews with the people who knew Joy. The conflict between man and nature is as intense as the inner conflicts the protagonist faces. The usual correlation between nature with women is beautifully subverted in this movie. As a foil to the saga of nymphs and mermaids, we have Joy, the mysterious man. Still, the rhetoric of nature and the grammar of fantasy is intact in this magical film. There is also scope for semantic analysis. The aptly named protagonist is simply an embodiment of the joy of oneness with nature. The Malayalam title of the movie has the connotation of a maze or labyrinth, symbolizing the inescapable and intricate ties between humankind and nature. Also, the nicknames of the characters are of animals who embody certain human characteristics.

Here, the medium and the message both have been revolutionized tremendously by the director. Once in a while, certain movies stride into the crowded list of films made so far, that proudly can fit into the category of both arthouse films as well as popular movies. *Aavasavyuham* is one such movie. It reminds one of Franz Kafka's *Metamorphosis*, Vladimir Chebotaryov and Gennadi Kazansky's *Amphibian Man* (1962) and Guillermo del Toro's *The Shape of Water* (2017), not in form but in essence.

Works cited

- Aavasavyuham: The Arbit Documentation of an Amphibian Hunt*. Directed by Krishand R.K. Sonyliv. 2022.
- Bookchin, Murray. *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*. A.K. Press, 2005.
- Dunlap, R. E. “Lay Perceptions of Global Risk: Public Views of Global Warming in Cross-national Context”. *International Sociology*, vol. 13, no. 4, 1998, pp. 473-498. <http://dx.doi.org/10.1177/026858098013004004>
- “Environmental Ethics: Between Anthropocentrism and Ecocentrism”. <http://home.iitk.ac.in/~anubha/CE213.pdf>
- Keller, D.R. and Golley, F.B. *The Philosophy of Ecology: From Science to Synthesis*, University of Georgia Press, 2000.
- Kopnina, Helen et al. “Anthropocentrism: More than Just a Misunderstood Problem”. *Journal of Agricultural and Environmental Ethics*, vol. 31, no. 1, 2018, pp. 109–127. <https://doi.org/10.1007/s10806-018-9711-1>
- Kortenkamp, K.V. and Moore, C.F. “Ecocentrism and Anthropocentrism: Moral Reasoning about Ecological Commons Dilemmas”. *Journal of Environmental Psychology*, vol. 21, no. 3, 2001, pp. 261–272.
- Shastri, Satish C. “ENVIRONMENTAL ETHICS ANTHROPOCENTRIC TO ECO-CENTRIC APPROACH: A PARADIGM SHIFT.” *Journal of the Indian Law Institute*, vol. 55, no. 4, 2013, pp. 522–30. *JSTOR*, <http://www.jstor.org/stable/43953654>. Accessed 14 Sept. 2022.

Masculinity in Motion: Analyzing the Movies *American Psycho* and *Taxi Driver* in Identity Construction

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Abstract

This research paper delves into the portrayal of masculinity in the films *American Psycho* and *Taxi Driver* and its implications for identity construction. Through a critical analysis of these iconic films and their resonance in contemporary society, it also explores the perpetuation of traditional gender norms and stereotypes in media representations. Additionally, it examines the compounding influence of social media platforms on perceptions of masculinity, highlighting the need for more inclusive narratives to empower individuals to embrace diverse expressions of gender identity. By synthesizing insights from film analysis, cultural critique, and media studies, this research aims to foster a deeper understanding of the complexities of gender identity in the modern era and contribute to ongoing discussions surrounding gender representation in media and society.

Keywords: Masculinity, Identity Construction, Social Media

Introduction

The representation of masculinity in films has always been something of fascination and condemnation – they reflect societal norms while serving as a counterstatement to them. Through films, such as *American Psycho* and *Taxi Driver*, for example, one can delve into the issue of the formation of identity and

how it has been shaped in modern society. This research paper takes an estimation of socio-sexual identity, media representations, and the influence of social media platforms on it by discussing those films and the implications they have had on identity formation.

The film *American Psycho*, directed by Mary Harron and based on Bret Easton Ellis's novel, is, first and foremost, a horrifying portrayal of the kind of masculinity to be found in 1980s Manhattan. Patrick Bateman, a rich investment banker, is a man for his age; his values have been formed by and moulded in the destructive environment of this period of materialist excess. Bateman is everything that is wrong with being a man – his priorities lie with appearances, wealth, and dominance. As such, his is a parody of the two-faced relationship between masculinity and consumerism, of society's insistence on men behaving like men according to the toxic standard. Similarly, in *Taxi Driver*, we have a portrayal of a man in crisis in the form of Travis Bickle. Bickle is the spiralling alienation and hopelessness of society at large. His descent into violence and obsession highlights the damaging effects of toxic masculinity on individual psyches and social dynamics, challenging viewers to confront their assumptions about strength, power, and identity.

Apart from the world of movies, social media platforms add complexity to this process. When everything is online nowadays, YouTube, Instagram, Twitter, etc., greatly contribute to the perception of both masculinity and femininity. Social media naturally results in far greater temptation to fit in, to be what society or the viewers would want you to be according to uploaded reels, memes, and narratives.

The purpose of this research is to depict the links among media representation, socio-sexual identity, and cultural narratives by reviewing how

masculinity is represented in *American Psycho* and *Taxi Driver*. The analysis of these movies is intended to demonstrate the difficulties and prospects of gender identity creation in the current century.

Analysis of American Psycho

The first scenes of *American Psycho* show drips of blood flowing gently in the background of the credits, giving the idea that the picture is a horror, but in the following frame, we see how those same drops turn out to be ordinary cranberry juice with nothing to do with gore. This play of opposites binds the entire film together, creating a perfect irony of the preconceptions accepted in society. The film's climax reaches an apotheosis as attempts to mislead the audience blur the lines between reality and twisted imagination, leaving uncertainty about whether Bateman's actions were genuine or merely products of his depraved fantasies.

The film's lead character alternates between two identities: a well-paid employee of a prestigious firm and a crazy psychopath who enjoys murder and cannibalism. Patrick is diligent about his appearance: he exercises regularly, chooses his clothing carefully, and even pays attention to small details like a business card or a pen. Patrick's most dualistic personality is evident in his attitudes toward others and social issues. For example, he blames his friends for making anti-Semitic jokes and is a staunch opponent of racism and economic unfairness, but this is just another costume he puts on himself. Greed and hypocrisy are major aspects of the main character's personality. Patrick has a strange sense of humor, and he sneers at his wretched life. In these rare instances, you can see how Bateman feels about himself. Patrick's ludicrous sense of humor is an unappreciated cry from his soul, a representation of the misery he is experiencing.

In the movie, *Patrick Bateman* is the main character, but we don't learn much about him as a person. We don't know about his family, his passions, or who he likes. We also don't know much about his job, other than it's on Wall Street. Patrick seems to care a lot about how he looks and what people think of him. He spends a lot of time at work, but we never see him doing much work. Instead, he's busy making restaurant reservations and criticizing his assistant's clothes. Even though he acts like he's successful and happy, he hates his job. This shows that Patrick cares more about appearances than anything else. He doesn't seem to have real connections with anyone. He's not close to his family, he's annoyed by his fiancée, and his friends are more like acquaintances. This superficial way of living reflects Patrick's insecurity. He's like a bird puffing up its chest to attract attention, but it's all just for show. Patrick's life may seem glamorous, but it's empty and shallow.

Patrick's narcissism, a prominent aspect of his character, is evident in his preoccupation with his appearance. Throughout the film's opening monologue, where viewers anticipate learning more about him, Patrick focuses solely on detailing his dietary habits, workout regimen, and skincare routine. However, the most intriguing revelation occurs towards the conclusion of his monologue. Patrick articulates a profound realization about his own identity, stating, "There is an idea of a Patrick Bateman, some kind of abstraction, but there is no real me. Only an entity, something illusory. And though I can hide my cold gaze, and you can shake my hand and feel flesh gripping yours, and maybe you can even sense our lifestyles are probably comparable, I simply am not there" (American Psycho 06:42-07:06). This declaration encapsulates the central theme of the film, illustrating how Patrick's immersion in superficiality has led to a detachment from his humanity.

Notably, this introspective moment is juxtaposed with Patrick removing a face mask, symbolizing a potential unveiling of his true self.

Patrick consistently arrives late to work, spending his time in the office listening to music and sketching in his notebook. Despite his efforts to stand out and maintain a distinctive presence, the main irony lies in the fact that the characters in the movie are surprisingly similar. This is highlighted by their frequent confusion of names and mistaken identities. The characters are so engrossed in their idyllic and carefree world that they refuse to acknowledge any alternative reality. For instance, Bateman occasionally shares his thoughts and secrets, confessing his enjoyment of murder during his free time, yet his revelations go unnoticed.

As the film unfolds, we witness Bateman's gradual descent into madness. His sadistic tendencies become increasingly subtle as he attempts to evade reality, eventually leading to the murder of more than seven individuals, including an elderly woman, a police squad, and a janitor. Distraught, Patrick hastily returns to his office and tearfully confesses all his crimes to his lawyer, Carnes. Following his candid admission, the protagonist revisits Paul Allen's apartment, where he previously committed murder, in an attempt to eliminate any evidence. However, to his surprise, it is revealed that Paul never resided in that apartment, signalling that many (or perhaps all) of Patrick's murders may have been figments of his imagination. This notion is further supported by the final scene, where Bateman meets with his lawyer, to whom he had previously confessed his crimes. Carnes dismisses the confessions as a joke and bewilderingly informs Patrick that Paul Allen is alive.

In the last scene, Bateman doesn't find relief. He's stuck in his private nightmare because he relies on other yuppies to acknowledge him as a murderer to

confirm his identity. When others don't recognize his truth, Bateman gets closer to madness and feels hopeless, "There are no more barriers to cross. All I have in common with the uncontrollable and the insane, the vicious and the evil, all the mayhem I have caused and my utter indifference toward it I have now surpassed. My pain is constant and sharp, and I do not hope for a better world for anyone, in fact, I want my pain to be inflicted on others. I want no one to escape, but even after admitting this, there is no catharsis, my punishment continues to elude me and I gain no deeper knowledge of myself; no new knowledge can be extracted from my telling. This confession has meant nothing" (American Psycho 1:36:09-1:42:02). The movie ends unclearly, prompting us to think about our warped views and realities. Like Patrick Bateman, we might feel trapped, want approval from others, and struggle to tell what's real from what's not ("American Psycho Explained | Movie & Ending Explained | Classic Explained Episode 4" 06:08-11:00). The ending of American Psycho reveals that Patrick Bateman created a sadistic universe in which he rejected all known morals and social norms to escape reality.

Analysing Taxi Driver

The protagonist of the movie is Travis Bickle, an ex-veteran and a taxi driver, he is portrayed as someone who feels like he does not belong to society. He is unable to make friends, women are not interested in him and he doesn't have a relationship with his parents. He blames other people for his failures and he is very lonely, loneliness can cause a person to become insecure and retreat from social interactions, which can start a vicious cycle of pessimism and hopelessness it can also result in increased mental health and emotional issues, chronic loneliness, sadness, sleeplessness, substance

abuse, cynicism, lack of accountability, and increasing social distancing. The entire movie features these symptoms.

Travis is dissatisfied with his job and surroundings, which leads him to work extended hours to cope with his insomnia. He avoids visiting his parents and harbours a deeply cynical perspective towards the people in his city, referring to them as "scum dogs" and "filth," and insisting that they need to be "cleaned out", "Thank God for the rain, which has helped wash away the garbage and trash off the sidewalks. I'm working long hours now: six in the afternoon to six in the morning. Sometimes, even eight in the morning, six days a week. Sometimes seven days a week. It's a long hustle, but it keeps me really busy. I can take in three, three-fifty a week. Sometimes even more when I do it off the meter. All the animals come out at night – whores, skunk pussies, buggers, queens, fairies, dopers, junkies, sick, venal. Someday, a real rain will come and wash all this scum off the streets." (*Taxi Driver* 05:15-06:23). Travis genuinely perceives himself as blameless, attributing all issues to others within his community.

Travis is a hypocrite in his thoughts and actions while criticizing the condition of the city, which is filled with junk. His own house is filled with garbage. He talks about the disorganized state of the city, whereas he lacks personal organization. At one instance, Travis takes Betty for a movie date, it was a pornographic movie, he didn't warn Betty about the type of movie and Betty leaves the theatre in disgust, this showcases his lack of self-awareness and his incapability in solving his problems and finding purpose.

"All my life needed was a sense of direction, a sense of someplace to go. I do not believe one should devote his life to morbid self-attention, but should become a person like other people" (*Taxi Driver* 10:09-10:20). Travis

used to be a mariner, where he felt like having a purpose but his current job is the exact opposite and symbolizes his lack of purpose. Travis works more hours than other drivers because he doesn't know where to go. He has no form of fulfilment or control over his life.

Travis has a conversation with Palantine that sparks the need for him to be a hero. Palantine asks for the things that irritate Travis, and he replies that the city is full of scum and needs to be cleaned. Travis is expressing his frustration over the environment and his community and he feels like the city needs a hero to be saved. According to Travis, the antagonists are African-Americans, Palantine, and Matthew. Travis connects with Iris because she also doesn't have control of her life and he sees a reflection of himself on her. Ultimately, he decides to take control of things. In a pivotal scene, Travis is in a car with Scorsese's character, who claims his wife is having an affair with a black man and intends to kill her with a 44-magnum pistol. Despite Scorsese's character being unhinged, Travis interprets this as validation for his twisted heroic fantasies. As Scorsese's character questions Travis's sanity, Travis gradually accepts the idea that his actions are justified.

In his twisted mind, Travis thinks that African-Americans, women, and men are scum and need to be removed from society. Travis opens up his mind to the Wizard. The Wizard tries to bring Travis back to sanity, but to which he replies that 'it is the dumbest thing,' this instance shows that he has slipped into insanity and is at a point of no return. Another instance in the movie is when he burns Betsy's flowers which symbolizes burning any potential future romantic relationships. Travis sees himself as greater than

the people around him, a man with a greater purpose who needs to do what no one else is doing.

Travis has broken his moral compass; he had killed a black man in a store and then he tries to kill Palantine and then he kills Mathew and his affiliates to save Iris. He gives up his old boring existence in pursuit of his new, better mission. In his depraved and dark state of mind, Travis thinks he is a vigilante, something like a superhero from a comic book. He thinks that he must intervene to preserve a collapsing metropolis, but in the final scene we can see Travis's eyes dart back and forth in and out of his rear-view mirror this final moment confirms that Travis is not fulfilled he's not a real hero and he's still so alone in Travis's mind.

How Social Media Shapes the Narratives of *American Psycho* and *Taxi Driver*

The most modern type of media, social media, has a wide range of features and attributes. It consolidates various functions within a single platform, including communication, text messaging, image, audio, and video sharing, as well as rapid content dissemination and global connectivity. Notably, it offers the most cost-effective and swift means of accessing global information, rendering it highly significant for individuals of all age groups. Its usage continues to surge worldwide at a remarkable pace, particularly among the youth who are swiftly transitioning from traditional electronic media such as television and radio. This rapid shift towards social media among all age groups, but especially among young people, underscores its profound influence on this demographic. The surge in social media usage has sparked numerous inquiries into its societal impact. While it's widely acknowledged that social media affects people's lifestyles, understanding the precise nature of these influences remains an ongoing endeavour, particularly about youth (Shabir et al.).

In recent decades, the rise of social media platforms in recent decades has changed how people engage with one another, communicate, and navigate society dynamics. In the contemporary digital age, social media's widespread presence has greatly influenced gender-related societal expectations, actions, and perceptions in the modern digital era. Social media has become a significant driver in forming modern gender norms when seen through a perspective that challenges and reinforces conventional gender stereotypes. "Social media's ability to redefine and maintain visual representations of masculinity and femininity is at the core of its impact on gender norms (Foster and Baker)." Social media platforms' visual cultures frequently provide idealized portrayals of femininity and masculinity, reinforcing long-standing gender stereotypes. But it also creates room for a range of gender identity manifestations, upending binary conceptions and broadening the range of representation.

The impact of social media on youth and adolescents is particularly significant, as they navigate identity formation and social integration. This group may experience emotions of inadequacy and gender-related concerns if they are constantly exposed to well-chosen pictures and lifestyles (Smith). Furthermore, social media sites may act as havens for cyberbullying, which frequently centres abuse on a person's gender and has a severe psychological toll on young people. Influencers, who wield significant influence over their followers, play a pivotal role in either perpetuating or subverting traditional gender norms through their content. According to a YouGov study conducted in 2023, 84% of boys aged 13 to 15 know who Andrew Tate was. In general, 25% of the males aged 13 to 15 who were interviewed had positive opinions about Tate. However, respondents were more inclined to agree with his opinions on masculinity (24%) and work and achievement (28%) than they were on how women should be treated (11%) (Smith). Social

media provides representations of many facets of masculinity. For instance, a study of the 43 male TikTok content creators who had the highest following revealed that these creators simultaneously upended and supported conventional notions of masculinity. They emphasized the value of masculine muscularity and "sexual bravado," while also celebrating nonconforming manifestations of masculinity like dancing and jewellery-wearing (Foster and Baker 7).

Individuals who watch television more frequently will eventually come to view the actual world more like what is shown on television. They will view it differently than people who watch television less frequently. Television tells stories with recurrent motifs that influence viewers' perceptions of the actual world. Cultivation Theory, conceptualized by George Gerbner and colleagues, offers a nuanced understanding of how media consumption influences individuals' perceptions of reality. The theory suggests that media promotes attitudes and beliefs held by the audience, it also talks about how repeated exposure to media can change an individual's perception over time (Sinn). This phenomenon is exemplified in individuals' selective intake of subjects which parallels with their existing beliefs, leading to the reinforcement of those viewpoints and a distortion of reality.

In the vast hellscape of social media, "literally me" characters have become increasingly popular, especially among young guys. "Literally me" characters are a particular kind of heroes who appeal to particular audiences (Firoozye). These personalities are renowned for the negative self-image they present rather than for their virtue or kindness. They're unconventional, displaying a lack of happiness with life, battling mental health issues, and finding it difficult to blend in with others, a long cry from the well-liked, reliable, and satisfied heroes we may all be used to. Characters from these genres have had a comeback in popularity recently, including Travis Bickle from *Taxi Driver* and Patrick Bateman from *American*

Psycho. Most men would relate themselves to these characters because these characters portray characteristics like archetypal, restrained and intelligent figures who defy societal expectations. Literally the characters constantly achieve a high level of social awareness; they often do this by overcoming a life of total existential emptiness, which is frequently accompanied by a crippling mental illness, and by transforming into a real self-affirmation and self-acceptance. With a "hey, I could've done that too!" mentality, these characters are utilized to critique and socially remark on the state of the human race and modern civilization.

Men have become greedy and obsessed with their appearances due to insecurity stemming from excessive beauty and societal standards. They also tend to be unhappy and emotionally empty, resembling Patrick Bateman from *American Psycho*. In the collective mind of Western culture, Patrick Bateman has always existed. He is a yuppie, an opportunist, a sexist, a drug addict, and a consumerist—never mind his deadly side. He is a mirror of so many things that are wrong with the world. Not only a figure of speech, he's almost a symbol. Without any irony, Bateman has also served as an inspiration. A case in point would be the gym rats who are fixated on getting Bateman's toned, muscular physique, a challenging goal that compelled Bale to follow an extremely stringent diet and rigorous exercise regimen.

Patrick Bateman gained popularity on the internet by participating in forums and social media on sites like 4chan and TikTok. And during the initial weeks of the 2020 coronavirus lockdown, several memes featuring Patrick Bateman quickly went viral. These included Bateman strolling while enjoying music from his Walkman, conversing confidently on a large wireless phone, holding a shiny axe, or engaging in sexual activity while admiring his toned body in a mirror. During

those days of confusion and chaos, Patrick Bateman came to represent militant capitalism, the epitome of manly virtue, and the epitome of pure manhood. Thus, the figure was a great fit for the archetype of the sigma male, which is comparable to the alpha male notion and is considered to be the latest socio-sexual identity to take over the internet. Millions have embraced the idea of the sigma male, which allows them to exist as the opposite of the alpha males, because they are frustrated with a world that seems bent on making things difficult for them (to the point of preventing them from leaving the house, during the pandemic), feeling misunderstood and relegated but still eager to feed their egos.

Years after their debut, these characters are still relevant, but for all the wrong reasons. The growing idolization of these personalities by men suggests a serious issue: insecurity. The underlying causes of this issue include an increase in loneliness and the pervasive societal stigma associated with men's mental health. The first "literally me" film dates back to the 1950s and *Rebel Without a Cause* (1956), which offered a counter-cultural viewpoint on the prevalent, conventional masculinity of post-war America. Consequently, the films *Taxi Driver* (1976) and *Clockwork Orange* (1972) might be seen as the forerunners of this genre. In the movie, Robert De Niro portrays Travis Bickle, a sleep-deprived cab driver who is thought to be experiencing post-traumatic stress disorder (PTSD) as a result of his experiences in the Vietnam War. He drives by prostitutes, criminals, and mentally ill people, witnessing the nightlife of late 1970s New York and viewing them as symbols of the decade's depravity and degeneracy. Eventually, Bickle decides to exercise his frustration and rage in the form of violence. Bickle masks himself with a hyper-masculine identity, he dresses as a cowboy and cuts his hair in mohawk style, these instances from the movie show that he is trying to be like a superhero who wants to save the city from this degenerate condition. An individual who

watches this movie idolises the characteristics portrayed by Bickel such as social isolation and reclusive behaviour, the character in the movie is socially awkward, and Bickel has the idea that the only solution to save the city from this degenerate condition is through violence. An individual can idolise these characteristics which are not normal in reality, the viewer may even try to consider these characteristics to be the new socially normative structure. These "literally me" characters are larger-than-life individuals who are prepared to face mortality head-on, take decisive action, and face their fears. The social alienation and hyper-commodification that arose from late-stage capitalism can be linked to the shift of identity away from communities and toward markets and goods. Men who are emotionally and/or sexually unhappy might find a cathartic release by relating to these individuals, who symbolize their aesthetics, beliefs, disappointments with contemporary society, social and societal indifference, and other things.

Conclusion

In conclusion, the exploration of masculinity in the films *Taxi Driver* and *American Psycho* shows the complexity of identity formation in contemporary society. This research delves into the complex interaction between media representation, socio-sexual identity formation, and the influence of social media platforms. Firstly, the analysis of the movie *American Psycho* portrayed the hyperbolic display of masculinity through the character of Patrick Bateman, whose narcissistic tendencies epitomize the pressure from society to stick to traditional gender norms. By examining the protagonist's obsession with consumerism and superficiality, we uncover the damaging impact of societal expectations on individual identity. Similarly, in *Taxi Driver* we see a moving portrayal of masculinity through the character of Travis Bickle, an individual who feels

alienated from the environment trying to find purpose in the metropolitan society. In this movie, we see the effects of toxic masculinity as the character descends into violence due to social negligence.

Moreover, this research delves into the impact of social media on identity building, going beyond the domain of film. In the present digital age social media platforms like Instagram, Twitter, YouTube and Reddit influence how an individual's perception of masculinity often through unrealistic beauty standards and gender stereotypes. The widespread use of social media increases the pressure to live up to these standards, further complicating the process of identity formation. From this research, it is understood how these movies portray masculinity, and how these depictions serve as a reflection and critique of societal norms and expectations. Through the characters of Patrick Bateman and Travis Bickle, we engage with the contradictions associated with traditional masculinity and the negative effects of its continued perpetuation.

This research also emphasizes how important it is to critically engage with gender images in the media and examine how they interact with larger socio-cultural narratives. Through an analysis of how masculinity is constructed in *American Psycho* and *Taxi Driver* and how this influences the process of identity development, we can gain important knowledge about the intricacies of modern gender dynamics. To achieve more inclusive and nuanced depictions in the media and society at large, we must keep challenging dominant ideas of masculinity. We may work toward a future where people are empowered to determine their own identities free from constrictive gender standards and stereotypes by encouraging diversity in narratives. In conclusion, the examination of masculinity in motion via the lens of *American Psycho* and *Taxi Driver* encourages more critical discussion and in-depth reflection on how identity is constructed in the contemporary world.

References

- “American Psycho Explained | Movie & Ending Explained | Classic Explained Episode 4.” *Youtube*, uploaded by Lucas Blue, 5 June 2021, <https://youtu.be/c47CLTbfuc>.
- “American Psycho in 5 Minutes.” *Youtube*, uploaded by minute recaps, 21 Jan. 2023, <https://youtu.be/QyE4GhAVysU>.
- American Psycho*. Directed by Mary Harron, Lionsgate Films, 2000.
- Chowdhury, Azneef. “The Distressing Reality of ‘Literally Me’ Characters.” *The Daily Star*, 7 Mar. 2023, www.thedailystar.net/shout/news/the-distressing-reality-literally-me-characters-3265686.
- “Cultivation Theory: Media Theories.” *Youtube*, uploaded by Sinn, 18 Jan. 2020, <https://youtu.be/07xIZDLQi9A>.
- Firoozye, Faris. “‘Literally Me’ Characters: A Take on Modern Pop Culture.” *The Oxford Blue*, 10 Feb. 2023, theoxfordblue.co.uk/literally-me-characters/#:~:text=%E2%80%9CLiterally%20me%E2%80%9D%20characters%20can%20come.
- Foster, Jordan, and Jayne Baker. “Muscles, Makeup, and Femboys: Analyzing TikTok’s ‘Radical’ Masculinities.” *Social Media + Society*, vol. 8, no. 3, July 2022, pp. 1–14, <https://doi.org/10.1177/20563051221126040>.
- Shabir, Ghulam, et al. “The Impact of Social Media on Youth: A Case Study of Bahawalpur City.” *Asian Journal of Social Sciences & Humanities*, vol. 3, no. 4, Nov. 2014, [www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.3\(4\)/AJSSH2014\(3.4-13\).pdf](http://www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.3(4)/AJSSH2014(3.4-13).pdf).
- Smith, Matthew. “One in Six Boys Aged 6-15 Have a Positive View of Andrew Tate | YouGov.” *Yougov.co.uk*, 27 Sept. 2023, yougov.co.uk/society/articles/47419-one-in-six-boys-aged-6-15-have-a-positive-view-of-andrew-tate.
- Taxi Driver*. Directed by Martin Scorsese, Columbia Pictures, 1976.
- Villalba, Juanjo. “Why Are Gen Z Men Obsessed with Patrick Bateman from ‘American Psycho’?” *EL PAÍS English Edition*, 11 Jan. 2023, english.elpais.com/culture/2023-01-11/why-are-gen-z-men-obsessed-with-the-main-character-of-american-psycho.html.
- Wikipedia Contributors. “Taxi Driver.” *Wikipedia*, Wikimedia Foundation, 23 Oct. 2019, en.wikipedia.org/wiki/Taxi_Driver.

Tracking Traditional Culinary Rhythms in Contemporary Indian Culture

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Abstract

Tradition and modernity are two contrasting aspects of culture that often coexist and interact in complex ways. Cultures adapt and evolve by incorporating elements of modernity while still preserving essential traditions. It often results in unique blends that reflect both the past and the present. The interplay between tradition and modernity is a dynamic and ongoing process that shapes the cultural landscape of societies. The synchronization of tradition and modernity in culinary culture is seen in fusion cuisines, a culinary approach that blends the flavours, ingredients, and cooking methods across cultures and traditions to produce distinctive dishes. The blending of the old and the new creates a dynamic culinary landscape that reflects both the roots of a culture and its adaptation to changing times. A culture while embracing innovation and adaptation to changing tastes and lifestyles, provides enough space for preservation of traditions and cultural heritage also. Tradition and modernity go hand in hand in contemporary culture.

Keywords: Culinary traditions, adaptations, inclusivity, consumption patterns, modernity

“Identity is not a set of fixed, attributed, unchanging essence of the inner self, but a constantly shifting process of positioning. We tend to think of identity as taking us back to our roots, the part of us which remains essentially the same across

time” (Hall 29). Cultural studies often emphasize that identity is not inherent but socially constructed. A significant focus of cultural studies is the study of popular culture. Cultural studies examine the production of cultural artifacts, how they are interpreted and the impact of globalization on cultural consumption. As an interdisciplinary field, cultural studies explore the intersections of culture, society, politics, and identity. It also delves into tracing the evolution of cultural practices over time and explores questions of cultural capital, taste, and cultural industries.

Cultures are not static; they evolve and change over time. “Culture is the name for what people are interested in, their thoughts, their models, the books they read and the speeches they hear, their table-talk, gossip, controversies, historical sense and scientific training, the values they appreciate, the quality of life they admire. All communities have a culture. It is the climate of their civilization” (Lippmann 385). Historical, social, economic, and political factors make significant impacts on cultural contexts. Understanding and respecting different cultures is important for promoting diversity, inclusivity, and mutual understanding in a globalized world.

Contemporary culture can be called a digital culture, influenced by a wide range of factors, including technological advancements, global events, artistic expressions, social movements, economic shifts and the like. The rapid advancement of technology has transformed the way people articulate, communicate, work, and interact. The emergence of social media, digital art forms, virtual reality, and artificial intelligence has had a profound impact on how individuals experience and engage with culture. Globalization has paved way to increased cross-cultural interactions and the blending of traditions, values, and ideas from different parts of the world. While traditions connect people through

shared experiences and history, social media connect people through digital communication and information sharing. The interplay between these two aspects of human culture can be complex, with both opportunities for enrichment and challenges to be navigated in the rapidly changing world. Multiculturalism, identity, and inclusivity have come to the fore.

Social media reflect and shape contemporary cultural norms and values. Internet and streaming platforms interfere with traditional media consumption patterns, leading to new ways of producing and consuming content. Growing consciousness of ecological issues has led to changes in consumption habits, commercial practices, and government policies. Sustainable living and eco-consciousness have become integral parts of contemporary cultural discourses. Deliberations on self-care, mindfulness, and holistic health have gained prominence.

As Paulo Coelho says, “Culture makes people understand each other better. And if they understand each other better in their soul, it is easier to overcome the economic and political barriers” (Coelho). Social media can spark a rekindling of certain traditions that are fading away. Communities can use these platforms to gather support and interest in revival of practices that were once central to their culture. Social media often serve as a space for innovative reinterpretations of traditional practices, blending them with modern elements to make them more relevant to younger generations. It has a significant impact on how traditions are shared, preserved, and transformed in today's interconnected world.

Food as a form of expression and cultural practice is an important aspect of cultural studies. Culinary traditions are the long-standing practices, customs, and techniques that have been developed and passed down through generations within

a particular culture or community. These traditions also encompass various aspects of food preparation, cooking methods, ingredients and even the social and cultural significance of food. Culinary traditions are constitutive of a culture's identity mirroring its history, geography, climate, and values. Indian culinary traditions are a reflection of the country's rich history, diverse cultures, and deep-rooted traditions. The variations in ingredients, preparation methods, and flavours make Indian cuisine a truly remarkable and vibrant culinary experience.

Indian gastronomic practices are rich, diverse, and deeply rooted in history and culture. They vary greatly across regions, reflecting the country's vast geographical and cultural diversity. Indian cuisine is often influenced by Ayurveda, an ancient system of medicine and well-being. Ayurvedic principles emphasize balancing flavours, energies, and the use of specific ingredients for health benefits. Indian culinary traditions are closely tied to religious festivals and rituals. Special dishes are prepared during festivals and religious ceremonies, and these dishes often vary by region and community.

Street food also is slowly becoming an integral part of Indian culinary landscape. Each region has its own unique street food specialties, showcasing the country's rich and varied culinary traditions. It is not only a source of livelihood, but also a reflection of India's cultural diversity. Meals are often communal events in Indian contexts. Families and friends gather to share food and create lasting memories. "Food is everything we are. It's an extension of nationalist feeling, ethnic feeling, your personal history, your province, your region, your tribe, your grandma. It's inseparable from those from the get-go" (Bourdain). Food can help anchor family traditions. It is not just sustenance and nourishment, but a powerful

cultural, social, and emotional tool that brings families together, strengthens bonds, and contributes to overall well-being and happiness.

Culinary traditions and social media have become intertwined in modern society, shaping the way we experience, share, and learn about food. Social media platforms like Instagram, Facebook, and YouTube provide opportunities for people to share their culinary experiences, recipes, and traditional dishes. This has led to the preservation and revival of many culinary traditions that might otherwise have been lost over time. People can now showcase family recipes, regional specialties, and cultural practices, helping to keep these traditions alive for future generations. Social media platforms have a profound impact on how people discover, share, and interact with food. They even influence food preferences and tastes.

As George Bernard Shaw states, “There is no sincerer love than the love of food” (71). Social media exposes individuals to a wide range of culinary traditions from around the world. From sharing family recipes to discovering new global flavours, it has the power to both preserve and evolve culinary practices. It has revolutionized the way people engage with culinary traditions and food culture. It offers a dynamic and interactive medium for learning, exploring, and celebrating the diverse world of food. There has been blending of culinary cultures, resulting in the creation of fusion cuisines that combine elements from different traditions. Chefs and home cooks often draw inspiration from various sources and experiment with new combinations, leading to innovative and exciting food creations. The democratization of culinary knowledge has empowered home cooks to learn new techniques and try out diverse recipes from around the world.

Though the world has gone modern and digital, traditions are still taken care of. There has been an increased awareness of the need for preserving traditions.

Culinary practices and eco-consciousness have become intertwined as people around the world recognize the importance of sustainable practices in food production, consumption, and preservation. This fusion of traditional culinary knowledge and environmental awareness has led to the emergence of several key trends and practices. Many culinary traditions inherently emphasize the use of local and seasonal ingredients. Preserving bio-diversity and valuing ethical considerations in dealing with natural resources are given utmost importance.

“A people without the knowledge of their past history, origin and culture is like a tree without roots” (Garvey). Indigenous culinary traditions often have a deep connection to the environment and are rooted in sustainable practices. These traditions are increasingly being celebrated and integrated into contemporary culinary scenes, promoting the preservation of traditional knowledge. The shift reflects a growing understanding of the interconnectedness of the universe as well as a commitment to preserve culinary heritage while adapting to the needs of a changing world. “Culinary tradition is not always based on fact. Sometimes it's based on history, on habits that come out of a time when kitchens were fuelled by charcoal” (Brown).

Contemporary festival celebrations often incorporate a wide range of culinary traditions that reflect cultural diversity, local flavours, and a sense of celebrations. Culinary traditions are integrated into modern festival celebrations. According to Nehru, “Culture is the widening of the mind and of the spirit. It is never a narrowing of the mind or a restriction of the human spirit or the country's spirit” (qtd. in Char 120). Festivals often highlight traditional dishes that hold cultural significance. Food has the power to evoke emotions and memories. Traditional dishes prepared during festivals create a sense of belonging and

nostalgia, fostering a strong community bond. Many traditional cooking techniques and recipes are passed down through generations. Festivals allow experienced cooks to share their expertise with younger generations, ensuring that these skills are not lost over time. “Digital culture and ordinary culture stay connected as identity is determined by both” (Barker 7).

Festivals provide a space for people to come together, share stories, and forge connections over a shared love for food. They serve as platforms to revive and reintroduce these traditions to the younger generation. Culinary traditions in contemporary festivals offer a dynamic way to celebrate culture, promote understanding among diverse groups, stimulate local economies, and pass on valuable traditions to future generations. Traditional dishes often elevate the festive atmosphere of family gatherings, making them more special and enjoyable for all participants. “One cannot think well, love well, sleep well if one has not dined well” (Woolf 15).

Culinary traditions are not static; they evolve over time. Contemporary culinary practices blend traditional recipes with modern twists, reflecting changing tastes and dietary preferences while still honouring the core elements of the tradition. Culinary traditions continue to hold immense relevance in contemporary societies by fostering cultural identity and emotional connections. India's vast geographical and cultural diversity is celebrated in its cuisine. Indian cuisine is a delightful blend of modern and traditional elements, reflecting the country's rich history, diverse culture, and evolving culinary trends. Traditional cuisines have been given a contemporary twist, combining traditional flavours with international ingredients. “The discovery of a new dish does more for human happiness than the discovery of a new star” (Savarin 9).

The diverse, multilingual and heterogeneous Indian culture is slowly on the path of developing a digital culinary culture. Shashi Tharoor says, “Development will not occur without a reassertion of identity: that this is who we are, this is what we are proud of, this is what we want to be. In this process, culture and development are fundamentally linked and are interdependent” (219). With better access to financial resources and technology, a majority of people have adopted a modern life style. The traditions do not much serve the purpose they once did, but they are still followed religiously in modern households. “Without the certainties of traditional, religious and cultural beliefs modern life may appear as a series of proliferating choices to be made without foundations. This encourages us to be more reflexive about ourselves since we have no certainties to fall back on” (Barker).

Traditions can adapt and evolve over time to remain relevant in contemporary society. This adaptability allows cultures to balance tradition with modernity. Tradition provides a sense of continuity and stability in a rapidly changing world. It offers a link to the past and reassures people that certain aspects of their culture will endure across generations. traditions have enduring significance in contemporary culture by connecting people to their roots, fostering social cohesion, preserving cultural heritage, providing emotional support, and contributing to the richness and diversity of modern society. While contemporary culture evolves, traditions remain a vital and adaptive part of our shared human experience.

Traditions have shown resilience by adapting to changing circumstances and incorporating new elements while retaining their core essence. This adaptability allows traditions to remain relevant and meaningful in contemporary

culture. While contemporary culture evolves, tradition remains a meaningful and adaptable part of human life. Culinary rituals are an integral part of culture, serving to define, preserve, and celebrate cultural heritage while also fostering social cohesion and reflecting the values and beliefs of a community. They are a rich and complex aspect of human culture, illustrating the deep connections between food, tradition, and identity. Culinary rituals are an integral part of culture, serving to define, preserve, and celebrate cultural heritage while also fostering social cohesion and reflecting the values and beliefs of a community.

The relevance of traditions may vary widely among individuals and cultures. While traditions can provide coherence, meaning, and a sense of continuity, they are not universally applicable or necessary. Some people may find value in traditions, while others may prefer a more secular or flexible approach to life. The value assigned to customs and practices is a purely personal and cultural matter, and people decide for themselves whether rituals play a meaningful role in their lives. Traditions create a bridge between generations, allowing older generations to pass on their wisdom and experiences to younger ones. This intergenerational transfer of knowledge helps societies evolve while retaining core values.

In contemporary culture, the significance of tradition lies in its ability to provide a sense of rootedness and cultural heritage while adapting to the evolving needs and values of society. Striking this balance between tradition and innovation is essential for the vitality and richness of contemporary cultures around the world. People have managed to evolve with the changing times, but at the same time traditions also are taken care of, in a general sense. Though there are some makeovers on culinary traditions, the essence remains the same. The intrinsic

values of traditions are never lost. There seems to be a general consensus among the people in this regard.

Works Cited

- “Alton Brown.” *AZQuotes.com*. Wind and Fly LTD. 2024
- Barker, Chris. “Cultural Identity, Representation and Otherness”. *Cultural Studies: Theory and Practice*. Sage Publications, 2016.
- Bourdain, Anthony. Interview. Conducted by National Geographic Traveller Magazine. December 2001.
- Char, K. T. Narasimha. *The Quintessence of Nehru*. George Allen and Unwin Ltd. 1961.
- Coelho, Paulo. Intercultural Dialogue. Conducted by UN News Centre. 13 March 2015.
- Hall, Stuart. *Familiar Stranger: A Life between Two Islands*. Duke UP, 2017. https://www.brainyquote.com/quotes/marcus_garvey_365148
- Lippmann Walter. “The Plural Society”. *The Essential Lippmann: A Political Philosophy for Liberal Democracy*, edited by Clinton Rossiter, and James Lare, Harvard UP, 1982.
- Savarin, Jean Anthelme Brillat. *The Physiology of Taste: or Meditations on Transcendental Gastronomy*. Knopf Doubleday Publishing Group, 2009.
- Shaw, George Bernard. *Man and Superman*. Cambridge UP, 1903.
- Tharoor, Shashi. *Bookless in Baghdad*. Penguin, 2005.
- Woolf, Virginia. *A Room of One’s Own*. Hogarth Press, 1929

Navigating the Maze of Teaching, Fatherhood and the Shadow of Injustice: An Analysis of the Multifaceted Role of Dronacharya in the *Mahabharatha*

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Abstract

This research explores the multifaceted character of Drona, a revered teacher in the ancient Indian epic, the *Mahabharata*. Drona also embodying the roles of a devoted father, and a figure of injustice in his dealings with Ekalavya. Drona's teaching methods are rigorous and demanding, requiring unwavering dedication and discipline from his students. He sets high standards and expects nothing less than excellence from those under his tutelage. Through his teachings, Drona instils in his students not only the technical aspects of archery and warfare but also the importance of loyalty, honour, and duty. Despite his strict demeanour, Drona also shows compassion and concern for his students' well-being. He takes pride in their accomplishments and is genuinely invested in their growth and success. Drona's role as a teacher extends beyond the training grounds; he serves as a mentor and guide, offering advice and support to his students in times of need. However, Drona's actions towards Ekalavya also raise questions about the ethical responsibilities of a teacher. By denying Ekalavya the opportunity to learn under him due to his low birth status and later demanding his thumb as *guru dakshina*. Drona demonstrates a moral ambiguity that complicates his portrayal as a noble teacher. This aspect of Drona's character challenges conventional notions of

mentorship and raises important ethical considerations about the role and responsibilities of teachers in society.

Key words: Mahabharata, Integrity, Compassion, Loyalty, Injustice.

Dronacharya, a pivotal character in the Indian epic *Mahabharata*, is indeed renowned as a revered teacher of warfare and archery. He is celebrated for his unparalleled mastery in archery and combat. He is revered as one of the greatest warriors of his time and is known for his exceptional skill in wielding weapons, particularly the bow and arrow. Dronacharya serves as the preceptor to both the Pandavas and the Kauravas, the two warring factions in the *Mahabharata*. Under his tutelage, the young princes receive rigorous training in martial arts, strategy, and warfare, preparing them for the challenges they will face as rulers and warriors.

Despite his personal allegiance to Hastinapura, the kingdom of the Kuru dynasty, Dronacharya demonstrates fairness and impartiality in his teaching. He imparts his knowledge and skills to all his students, regardless of their lineage or background, treating them equally in his quest to mould them into skilled warriors. Dronacharya's role as a teacher is not without ethical dilemmas. His loyalty to Hastinapura sometimes puts him in difficult situations, forcing him to navigate conflicting loyalties and moral principles. For example, his involvement in the Kurukshetra war raises questions about his duty as a teacher and his responsibility to uphold righteousness.

As a revered teacher of martial arts and warfare, Drona's message to society would likely encompass profound principles of ethics, discipline, and personal development. Firstly, he would emphasize the importance of education and training, not only in the arts of combat but also in intellectual pursuits and moral

values. Drona would stress the idea that true strength comes from knowledge and skill, rather than mere physical prowess. In terms of character development, Drona would advocate for virtues such as integrity, loyalty, and humility. He would encourage individuals to uphold their principles even in the face of adversity, and to always strive for excellence in their endeavours. Drona's teachings would also underscore the importance of discipline and self-control, as essential traits for success in both personal and professional life.

Furthermore, Drona's message would likely include a call for unity and cooperation within society. Just as he trained warriors to work together as a team, he would urge people to set aside differences and work towards common goals for the greater good. He would emphasize the need for mutual respect and understanding, fostering a sense of community and solidarity among all members of society. Ultimately, Drona's message to society would be one of balance and harmony, advocating for the cultivation of both inner strength and outer peace. Through his teachings, he would aim to inspire individuals to lead lives of purpose, integrity, and compassion, contributing to the betterment of themselves and the world around them.

Drona's teachings emphasize discipline, skill mastery, and loyalty. His message to society could revolve around the importance of education, both in academics and character development. He might stress the value of honour, duty, and righteousness in all aspects of life, promoting harmony, justice, and the pursuit of excellence. Drona's connection with the Kurukshetra War is deeply intertwined with the political dynamics and personal relationships of the Mahabharata epic. As the military teacher (*acharya*) of both the Pandavas and the Kauravas, Drona held a position of immense influence and power. Trained in warfare and archery, he was renowned for his mastery over various weapons and his strategic acumen.

Drona's involvement in the war stemmed from his allegiance to Hastinapura, the kingdom ruled by the Kuru dynasty. Despite his affection for his former pupil Arjuna, who was one of the Pandavas, Drona sided with the Kauravas due to his loyalty to their family. This decision was influenced by his longstanding friendship with King Dhritarashtra, the father of the Kauravas, as well as his sense of duty to his benefactor, King Duryodhana. Throughout the conflict, Drona played a crucial role in shaping the battlefield. His leadership of the Kaurava army was marked by strategic brilliance and tactical expertise. He deployed various military formations, including the *Chakravyuha*, a circular formation that was famously penetrated by Abhimanyu, Arjuna's son, during the war. However, Drona's involvement in the war was not without moral dilemmas. He faced internal conflicts regarding his duty as a teacher and his personal relationships with the Pandavas. Despite his respect for Arjuna, Drona remained committed to his obligations to the Kauravas, ultimately leading to tragic consequences.

One of the most poignant moments of the Kurukshetra War was Drona's demise. Manipulated by the Kauravas into believing a false rumour about the death of his son Ashwatthama, Drona fell into a state of despair. He was then slain on the battlefield by a group of warriors led by Dhrishtadyumna, the brother of Draped and a sworn enemy of Drona. His death marked a significant turning point in the war, leading to further escalation and ultimately, the defeat of the Kauravas. In summary, Drona's connection with the Kurukshetra War is multifaceted, encompassing loyalty, duty, friendship, and moral dilemmas. As the Acharya of both sides, his actions and decisions profoundly influenced the course and outcome of the epic conflict.

Drona's paternal love for his son Ashwatthama had a profound impact on his actions during the war of Kurukshetra, influencing both his adherence to dharma and ultimately contributing to the downfall of the *Kauravas*. Firstly, Drona's love for his son clouded his judgment and led him to prioritize personal emotions over his duty as a warrior and teacher. As a result, he became susceptible to manipulation and deceit. When he received false news of Ashwatthama's death, Drona's grief and despair overwhelmed him to the extent that he lost his will to fight. This emotional vulnerability made him an easy target for Krishna and the Pandavas, who exploited his weakness to achieve their strategic goals. This instance highlights how paternal love can obscure one's sense of duty and moral responsibility, causing them to deviate from the path of righteousness.

Furthermore, Drona's unconditional love for Ashwatthama drove him to take drastic measures to protect his son, regardless of the consequences. This led to the infamous incident where Drona demanded the capture of Yudhishtira, the eldest of the Pandavas, knowing that only his death or capture could break the formation of the Pandava army. Despite knowing that such a demand went against the rules of honourable warfare, Drona's desire to safeguard his son's well-being outweighed his commitment to dharma. Ultimately, Drona's inability to separate his personal attachments from his duty as a warrior and mentor contributed to the downfall of the *Kauravas*. His actions, driven by paternal love, created divisions within the *Kaurava* camp and weakened their morale. Moreover, his death at the hands of deceit further demoralized the *Kauravas* and bolstered the resolve of the *Pandavas*. Thus, while paternal love is a powerful and noble sentiment, it can also cloud judgment and lead individuals astray from the path of righteousness, as demonstrated by Drona's tragic downfall during the war of Kurukshetra.

In the *Mahabharata*, Dronacharya's treatment of Ekalavya is a prime example of injustice driven by societal bias and personal agenda. Ekalavya, a talented archer from a lower caste, approached Dronacharya seeking to become his disciple and learn the art of archery. Despite Ekalavya's dedication and skill, Dronacharya, influenced by his favouritism towards his royal students like Arjuna, turned him away. However, Ekalavya was undeterred and resolved to master archery on his own. He created a clay image of Dronacharya and practiced tirelessly in front of it, becoming an exceptional archer through sheer determination and talent. When Dronacharya learned of Ekalavya's prowess, he felt threatened by his skill and reputation. In a move driven by jealousy and a desire to maintain the superiority of his favourite student, Arjuna, Dronacharya approached Ekalavya and demanded an unthinkable price for his skill: Ekalavya's right thumb, essential for archery. This demand was not only unjust but also cruel, as it was intended to cripple Ekalavya's ability to excel in his chosen field.

Ekalavya, despite the immense pain and injustice inflicted upon him, submitted to Dronacharya's demand without hesitation, displaying unwavering loyalty and respect towards his would-be guru. This act highlights the deep-rooted caste prejudice and power dynamics prevalent in ancient Indian society, where individuals from lower castes were often denied equal opportunities and subjected to exploitation by those in positions of authority.

So Dronacharya's treatment of Ekalavya exemplifies the injustice and cruelty perpetuated by societal biases and personal agendas. Ekalavya's story serves as a poignant reminder of the struggles faced by marginalized individuals and the resilience required to overcome systemic oppression. At the same time his treatment of Arjuna in the *Mahabharata* is characterized by favouritism, special

attention, and extensive mentorship. Arjuna, as the third Pandava prince, was not only Dronacharya's student but also held a special place in his heart due to his exceptional skill and lineage.

From the outset, Dronacharya recognized Arjuna's innate talent and potential as an archer. He provided Arjuna with personalized training, guidance, and access to advanced techniques, often withholding these from other students. Dronacharya's investment in Arjuna's development was evident in his willingness to push Arjuna to his limits, challenging him to surpass even his own expectations. Dronacharya's favouritism towards Arjuna was also reflected in his actions during various competitions and battles. He consistently supported Arjuna, offering him strategic advice and encouragement. Additionally, Dronacharya often showcased Arjuna's skills to demonstrate the prowess of his teaching methods, further cementing Arjuna's reputation as his prized pupil.

Dronacharya's bond with Arjuna extended beyond the battlefield. He served as a mentor and father figure to Arjuna, imparting not only martial knowledge but also wisdom and moral guidance. Their relationship was built on mutual respect and trust, with Dronacharya nurturing Arjuna's character alongside his martial abilities. His treatment of Arjuna was marked by a combination of favouritism, personalized mentorship, and unwavering support. Through his guidance and encouragement, Dronacharya played a significant role in shaping Arjuna into one of the greatest warriors of his time, earning him a place of honour and respect in the annals of Indian mythology.

Despite the tragic events of the *Mahabharata*, Dronacharya's legacy as a teacher endures. He is remembered as a wise and compassionate mentor who imparted invaluable lessons in courage, discipline, and honour to his students,

leaving an indelible mark on the epic and its characters. Dronacharya's portrayal as a teacher in the *Mahabharata* offers both positive and negative lessons for society:

1. Positive Aspects as a Role Model:

Dronacharya's unparalleled mastery in archery and combat showcases the value of expertise and skill in teaching. His dedication to honing his own abilities sets a high standard for teachers to continuously improve themselves. Despite personal allegiances, Dronacharya treats all his students equally and imparts knowledge without bias. His fairness and impartiality demonstrate the importance of treating students with respect and providing equal opportunities for learning. Dronacharya instils discipline and diligence in his students through rigorous training and high expectations. His emphasis on hard work and perseverance serves as a valuable lesson for teachers and students alike.

2. Negative Aspects and Ethical Dilemmas:

Dronacharya's loyalty to Hastinapura sometimes leads him to compromise his principles and participate in questionable actions. His involvement in the Kurukshetra war raises ethical dilemmas about the responsibilities of teachers in times of conflict. While Dronacharya strives to be impartial, instances of favouritism and discrimination are present in his teachings. His treatment of Ekalavya, a talented but low-caste student, raises questions about fairness and equality in education.

Dronacharya's character in the *Mahabharata* offers valuable lessons on expertise, fairness, and discipline. His portrayal also highlights the complexities and challenges faced by teachers in navigating ethical dilemmas and maintaining integrity. As a role model for teaching society, Dronacharya serves as a reminder

of the importance of continuous learning, fairness, and ethical conduct in the teaching profession.

Works Cited

Vyasa, Krishna Dwaipayana. "Mahabharata." Translated by Kisari Mohan Ganguli,

1883-1896, Sacred Texts,

<http://www.sacredtexts.com/hin/maha/index.htm>.

---. "Mahabharata." Translated by J.A.B. Van Buitenen, University of Chicago

Press, 1973-1978.

---. Translated by Kisari Mohan Ganguli, Munshiram Manoharlal Publishers, 2009.

A Study on Level of Awareness and Investor's Perception about Mutual Fund with Special Reference to Tripunithura, Ernakulam

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Abstract

Now days mutual funds are emerging as the favorite investment vehicle, it is because of the many advantages they have over other forms and the avenues of investing, particularly for the investor who has limited resources available in terms of capital and the ability to carry out detailed research and market monitoring. This study aims to help the investors to reap the benefits of mutual fund as an investment and also to know the awareness and perception of the investors towards mutual fund investment. It also focuses on the relationship between demographic factors like gender, age, occupation, annual income etc. and investment in mutual fund.

Keywords: investment, investment avenue, mutual fund, awareness, perception.

Introduction

A Mutual Fund is the most suitable investment to the common man as it offers an opportunity, to invest in a diversified, professionally managed basket of securities at relatively low cost. That does not mean mutual fund investments risk free. Mutual fund investments are subject to market risk and every fund manager is expected to design the portfolio keeping in view the investment objective of a particular mutual fund scheme. This is because the money that is pooled in are not invested only in debts funds which are less risky but are also invested in the stock

markets which involves a higher risk but can expect higher returns, because diversification reduces the risk, all stocks may not move in the same direction in the same proportion at the same time. Mutual fund in the recent years has become very popular among investors. This study throws lights on the investor’s awareness and perception towards mutual fund i.e. their behavior and attitude while making investment in mutual funds. And also attempts to find out the relationship between demographic factors and investment in mutual fund.

Methodology

This study was descriptive in nature and based on both Primary Data and Secondary Data. Primary Data for this study is based on structured pre-tested questionnaire, which were collected from 50 investors of mutual fund. Secondary Data for this study was obtained from Books, Published Journals and Website. For the purpose of study, a sample of 50 investors of mutual fund were collected based on convenience Sampling. The main tools used for this study are percentage analysis and Chi-square.

Table. 1
Demographic profile of the respondents (sample size 50)

Sl. no	Demographics		No. of Respondents	Percentage
1	<i>Age</i>	less than30	25	50%
		30-50	15	30%
		more than50	10	20%
2	<i>Occupation</i>	Service	23	46%
		Business	15	30%

		Others	12	24%
3	Income	less than 2.5lkhs	30	60%
		2.5lkhs- 5lkhs	12	24%
		more than 5lkhs	8	16%
4	Experience	less than3years	15	30%
		3-5 years	16	32%
		more than5 years	14	28%
		No experience	5	10%

Source: primary Data

The above table reveals that the majority of the respondents have age of below 30. 50% respondents are coming under this category. 30% of respondents have age between 30 and 50. And only 20% of respondents have age above 50. Majority of investors are from service sector, which comes to 46% of total respondents. 30% of the respondents are from business and 24% of the respondents are from other sectors. Majority of respondents have annual income up to 250000. It comes to 60% of total respondents. 24% of the respondents have annual income between 250000-500000. And 16% of the respondents have annual income above 500000. 32% of respondents have experience of 3-5 years, 30% of the respondents have experience up to 3 years and 28% of respondents have experience above 5 years. And only a few numbers of respondents have no experience, it comes to 10% of respondents.

H₀:- no significant difference between demographic factors of respondents and reason for investment in mutual fund.

Table 2
Demographic factors and reason for investment.

Categories		Profita bility	Safety	Consist ency	Diversif ication	Total	Chi- square value*	Sig. Dif at 5%*
<i>Age</i>	<30	16	4	0	5	25	27.28	.000
	30-50	6	6	0	3	15		
	>50	3	0	5	2	10		
<i>Occupation</i>	Service	10	6	3	4	23	4.363	.628
	Business	8	1	2	4	15		
	Others	7	3	0	2	12		
<i>Income</i>	< 2.5lkhs	14	7	2	7	30	5.4	.494
	2.5lkhs- 5lkhs	7	3	1	1	12		
	>5lkhs	4	0	2	2	8		
<i>Experience</i>	<3years	5	6	0	4	15	61.247	.000
	3-5 years	11	0	0	5	16		
	>5 years	9	4	0	1	14		
	No experience	0	0	5	0	5		

Source: primary data
generated value

*SPSS

Chi-square value at 5% level of significance reveals that significant difference existed among various age and experience categories with respect to the respondents' reason for investing in mutual fund. Further no significant differences were found among the respondents belonging to various occupational and income

categories.

H₀:- no significant difference between demographic factors of respondents and income invested in mutual fund.

Table 3
Demographic factors and income invested.

Categories		Up to 4%	5%- 10%	11%- 20%	Above 20%	Total	Chi- square value*	Sig. Dif at 5%*
<i>Age</i>	<30	8	10	4	3	25	3.662	.722
	30-50	8	5	1	1	15		
	>50	2	5	2	1	10		
<i>Occupation</i>	Service	6	8	6	3	23	8.888	.180
	Business	5	7	1	2	15		
	Others	7	5	0	0	12		
<i>Income</i>	<2.5lkhs	18	12	0	0	30	54.143	.000
	2.5lkhs- 5lkhs	0	8	4	0	12		
	>5lkhs	0	0	3	5	8		
<i>Experience</i>	<3years	6	5	2	2	15	5.384	.800
	3-5 years	5	7	3	1	16		
	>5 years	7	5	1	1	14		
	No experience	0	3	1	1	5		

Source: primary data
generated value

*SPSS

Chi-square value at 5% level of significance reveals that significant differences existed among various income categories with respect to the respondents'

investments in mutual fund from their income. Further, no significant differences were found among the respondents’ belonging to various age, occupational and experience categories.

H₀:- no significant difference between demographic factors of respondents and knowledge regarding mutual fund.

Table 4
Demographic factors and respondent’s knowledge regarding mutual fund.

Categories		Good	Average	Poor	Total	Chi-square value*	Sig. Dif at 5%*
<i>Age</i>	<30	21	4	0	25	31.367	.000
	30-50	6	9	0	15		
	>50	3	2	5	10		
<i>Occupation</i>	Service	16	4	3	23	10.560	.032
	Business	10	3	2	15		
	Others	4	8	0	12		
<i>Income</i>	<2.5lkhs	17	11	2	30	4.028	.402
	2.5lkhs- 5lkhs	9	2	1	12		
	>5lkhs	4	2	2	8		
<i>Experience</i>	<3years	11	4	0	15	51.003	.000
	3-5 years	11	5	0	16		
	>5 years	8	6	0	14		
	No experience	0	0	5	5		

Source: primary data generated value

*SPSS

Chi-square value at 5% level of significance reveals that no significant difference exists among various categories of income of respondents with respect to the

respondents' knowledge regarding mutual fund. Further, significant differences were found among the respondents belonging to various age, occupation and experience categories.

H₀:- no significant difference between demographic factors of respondents and risk tolerance level.

Table 5
Demographic factors and their risk tolerance level.

Categories		High	Medium	Low	Total	Chi-square value*	Sig. Dif at 5%*
<i>Age</i>	<30	9	9	7	25	13.334	.010
	30-50	6	8	1	15		
	>50	3	0	7	10		
<i>Occupation</i>	Service	12	5	6	23	14.284	.006
	Business	5	3	7	15		
	Others	1	9	2	12		
<i>Income</i>	<2.5lkhs	8	13	9	30	6.134	.189
	2.5lkhs- 5lkhs	5	4	3	12		
	>5lkhs	5	0	3	8		
<i>Experience</i>	<3years	9	6	0	15	21.904	.001
	3-5 years	3	3	10	16		
	>5 years	4	8	2	14		
	No experience	2	0	3	5		

Source: primary data generated value

*SPSS

Chi-square value at 5% level of significance reveals that significant differences existed among various age, occupational and experience categories of respondents with respect to their risk tolerance level. Further, no significant difference existed among income categories of respondents.

Table 6
Respondents satisfaction with mutual fund investment

Sl. No	Satisfaction	Investment	No. of Respondents	Percentages
1	Satisfied	Mutual Fund	38	76%
2	Not Satisfied	Bank Deposit	3	6%
		Shares	5	10%
		Real Estate	4	8%
Total			50	100%

Source: Primary Data

The above table reveals that majority of respondents were prefer mutual fund as most beneficial investment opportunity. It comes to 76% of respondents that means those respondents who are satisfied with their investments in mutual funds will prefer mutual fund as the most beneficial investment opportunity than other investment avenues. 10% of respondents prefer shares as most beneficial investment opportunity. 8% of respondents prefer real estate and 6% of respondents prefer bank deposit as most beneficial investment opportunity.

Conclusion

From this study we can conclude that the investors are possessing good knowledge about mutual funds. The investors are perceived that mutual fund investment involves risk. The investors were selecting the scheme of mutual fund for making an investment on the basis of their risk tolerance level. Majority of investors are satisfied with their investments in mutual fund and they will continue their investments in mutual fund. From the analysis of demographic factors of respondents, the researcher finds out that these factors were influencing the investments in mutual fund. And this study gives some suggestions to the mutual fund firms; Efforts should be made to promote online trading of mutual funds. This will save time and cost. This can be done by educating the people in this regard. Each mutual fund should be required to establish its own investors grievance cell. This will help to sort out the grievances of the investors. Mutual funds should build investors' confidence through schemes meeting the diversified needs of investors, speedy disposal of information, improved transparency in operations, better customer services and assured benefits due to professionalism.

Reference

1. E. Gordon & K. Natarajan. Financial Markets and Services. Himalaya Publishing House, Mumbai. 2010.
2. Janet. Patricia. Financial Services. Pratibha Publications, Changanassery. 2010.
3. Indian Institute of Banking and Finance. Principles and Practices of Finance. Macmillan second Edition
4. Kothari. C. R. Research Methodology-Methods and Techniques. New Age International Publishers, New Delhi. 2007.

5. Dr. A P Philip. Capital Market and Investment Management. Soba Publications, Changanassery. 2012.
6. The Economic Times. Thursday 27 February 2014. Page No. 8
7. Rajesh Kumar, R.S Arora. Investors' Perception about Mutual Funds in India: An Empirical Study. Indian Journal of Finance, 2013; 7(1). pp.44-52.
8. Bharna, S. Myths of Systematic Investment Plan, Mutual Funds in India. Wisdom Publications, 2007; pp.91-92.
9. Bodla, B S and Bishnoi, S. Emerging Trends of Mutual Funds in India: A Study across Category and type of schemes. Journal of Indian Management and Strategy, 2008; 13(1). pp-15-20
10. Gilkar, N.A. Investors Perceptions of Mutual Funds: An Investigation. The Business Review, 2002; 9(1). pp 26-35.
11. Gupta, A. Investment Performance of Indian Mutual Funds: An Empirical Study. Finance India, 2000; 14(3). pp.833-866.
12. Mishra. The Dawn of Mutual Funds: Exciting Investment Opportunities Ahead. Journal of commerce, 1987; 5(1). pp.12-18.
13. Panda, T.K and Tripathy, N.P. Customers Orientation in Designing Mutual Fund Products. The ICFAI Journal of Applied Finance, 2001; 7(4). pp.20-28.
14. Pasricha, J.S and Jain, S. Performance Evaluation of Mutual Funds. Punjab Journal of Business Studies, 2005; 1(1). pp.102-110.
15. Singh, Y.P and Vanita. Mutual Funds Investors Perceptions and Prefrences: A Survey. The Indian Journal of Commerce, 2002; 55(1). pp-8-12.
16. Sudalaimuthu, S and Kumar, P S. A Study on Investors Perceptions Towards Mutual Fund Investments. Journal of Commerce, 2008; 5(1). pp-106-110.
17. Tripathy, N.P. An Empirical Analysis of Performance Evaluation of Mutual Funds in India: A Study of Equity Linked Saving Schemes. The ICFAI Journal of Applied Finance, 2004; 10(7). pp.36-54.

A Study on Effectiveness of Containerization Management with Reference to Aspinwall & Co. Ltd, Willington, Cochin.

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Abstract

The paper is entitled “A study on the effectiveness of containerization with reference to Aspinwall and Co. Ltd, Cochin. The study was conducted to know the impact of containerization management and to determine the contribution obtained from effective containerization management in India. Containerization is a system of intermodal freight transport using intermodal containers (also called shipping containers and ISO containers). The containers have standardized dimensions. They can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another-container ships, rail transport flatcars, and semi-trailer trucks-without being opened. The handling system is completely mechanized so that all handling is done with cranes and special forklift trucks. All containers are numbered and tracked using computerized systems. Aspinwall & Co. Ltd., is one of the earliest commercial enterprises in the Malabar - Coast of South India, established in the year 1867, by the legendary English trader and visionary, John H. Aspinwall. Today, Aspinwall & Co. Ltd. has diversified business interests in the areas of Logistics, Speciality Coffee Natural Fiber Products, Natural Rubber and Tourism. Aspinwall And Company Limited is a Public incorporated on 20 September 1920. It is classified as Non- govt company and is registered at Registrar of Companies, Ernakulam. Its authorized share capital is Rs. 250,000,000 and its paid up capital is Rs. 78,182,880. In Aspinwall , there is

proper yard management & containerization helped Aspinwall to enhance their productivity. The study concludes with a wide range of findings and suggestions .

Keyword: Containerization

Introduction

Containerization is a system of intermodal freight transport using intermodal containers (also called shipping containers and ISO containers). The containers have standardized dimensions. They can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another container ships, rail transport flatcars, and semi-trailer trucks without being opened. The handling system is completely mechanized so that all handling is done with cranes and special forklift trucks. All containers are numbered and tracked using computerized system.

Containerization originated several centuries ago but was not well developed or widely applied until after World War II, when it dramatically reduced the costs of transport, supported the post-war boom in international trade, and was a major element in globalization. Containerization did away with the manual sorting of most shipments and the need for warehousing. It displaced many thousands of dock workers who formerly handled break bulk cargo. Containerization also reduced congestion in ports, significantly shortened shipping time and reduced losses from damage and theft. Containers can be made of weathering steel to minimize maintenance needs. During the first 20 years of containerization, many container sizes and corner fittings were used; there were dozens of incompatible container systems in the United States alone. Among the biggest operators, the Matson Navigation Company had a fleet of 24-foot (7.32 m) containers, while Sea-Land Service, Inc used 35-foot (10.67 m) containers. The

standard sizes and fitting and reinforcement norms that now exist evolved out of a series of compromises among international shipping companies, European railroads, US railroads, and US trucking companies. Four important ISO (International Organization for Standardization) recommendations standardized containerization globally.

Statement of the problem

The aim of the study is to know the effectiveness of containerization management in Aspinwall & Co. Ltd, Willington, Cochin. The study also identifies the factors and impact of containerization management in Aspinwall & Co. Ltd, Willington, Cochin.

Significance of the study

Containerization greatly reduced the expense of international trade and increased its speed, especially of consumer goods and commodities. It also dramatically changed the character of port cities worldwide. Prior to highly mechanized container transfers, crews of 20–22 longshoremen would pack individual cargoes into the hold of a ship. After containerization, large crews of longshoremen were no longer necessary at port facilities, and the profession changed drastically.

Meanwhile, the port facilities needed to support containerization changed. One effect was the decline of some ports and the rise of others. At the Port of San Francisco, the former piers used for loading and unloading were no longer required, but there was little room to build the vast holding lots needed for container transport. As a result, the Port of San Francisco virtually ceased to function as a major commercial port, but the neighboring port of Oakland emerged as the second

largest on the US West Coast. A similar fate met the relation between the ports of Manhattan and New Jersey. In the United Kingdom, the Port of London and Port of Liverpool declined in importance.

Meanwhile, Britain's Port of Felixstowe and Port of Rotterdam in the Netherlands emerged as major ports. In general, inland ports on waterways incapable of deep draft ship traffic also declined from containerization in favor of seaports. With intermodal containers, the job of sorting and packing containers could be performed far from the point of embarking.

The effects of containerization rapidly spread beyond the shipping industry. Containers were quickly adopted by trucking and rail transport industries for cargo transport not involving sea transport. Manufacturing also evolved to adapt to take advantage of containers. Companies that once sent small consignments began grouping them into containers. Many cargoes are now designed to fit precisely into containers. The reliability of containers also made just in time manufacturing possible as component suppliers could deliver specific components on regular fixed schedules. In 2004, the global container's traffic was of 354 millions of TEU, with an estimated 82- per-cent share handled by the top-100 container ports.

Objectives of the study

- To study the effectiveness of containerization management with reference to Aspinwall & Co. Ltd, Willington, Cochin
- To identify the problems of containerization management.
- To study the different types of containers used by the company for containerization with regard to Aspinwall cochin.
- To study the impact of containerization management in Aspinwall.

Research methodology

The present study's core objective is to study the effectiveness of containerization management with reference to Aspinwall, Cochin. The study was conducted during 1st August to 1st September.

Sample and sampling technique

The study is based on the primary data collected through personal interview, observation, questionnaire with the staff of Aspinwall & Co. Ltd, Willington Island, and Cochin. Convenience sampling method is used for collection of data.

Source of data

The primary data was collected through personal interview, observation and through questionnaire distributed among the staff of Aspinwall, Cochin. The secondary data was collected from websites, online articles, reports etc.

Data analysis

The statistical tool used here for analysis is percentage method.

Limitations of the study

- The availability of all the staff under one roof was a limitation to the study.
- Employees are not ready to disclose all information.

Analysis and interpretations

Table .1

Particulars	No. of respondents	Percentage
Enhanced productivity	26	43
Increased profitability	14	23
Improved security	8	13
All of the above	12	20
Total	60	100

Table showing what are the benefits that containerization has made in Aspinwall

Interpretation

The above results show that 43% of employees are saying that containerization has benefited in enhanced productivity, 23% say increased profitability, 13% say improved security and about 20% say it has resulted in all of them

Table .2

Particulars	No. of respondents	Percentage
RTGC	38	63
QC	16	27
Stacker	5	8
ECH	1	2
Total	60	100

Table showing which is the most commonly used container handling equipment

Interpretation

The above results show that 63% employees are saying that RTGC is the most commonly used container handling equipment, 27% say its QC, 8% say its Stacker and the remaining 2% say its ECH.

Table .3

Particulars	No. of respondents	Percentage
Documentation	18	30
Customs clearance	13	22
Scanning and seal	9	15
All of the above	20	33
Total	60	100

Table showing what all are the processes to be Completed for the movement of containers

Interpretation

The above results show that 30% of employees are saying that documentation has To be completed for the movement of goods, 22% say its customs clearance, 15% Say scanning and sealing and 33% of them say they've to go through all of these processes.

Table .4

Particulars	No. of respondents	Percentage
Documentation	18	30
Customs clearance	13	22
Scanning and seal	9	15
All of the above	20	33
Total	60	100

Table showing which is the most common Charge imposed on containers

Interpretation

The above results show that 42% of the employees say that terminal handling Charge is the most common charge imposed on containers, 31% say pilot Cancellation charge, 12% say berth handling charges and 15% say its other Charges

Table .5

Particulars	No. of respondents	Percentage
Yard capacity overflow	12	20
Less productivity	32	53
Operational hindrances	11	18
Others	5	8
Total	60	100

Table showing what are the impact on Containerization at Aspinwall due to trade Union strikes

Interpretation

The above results show that 53% of the employees say that trade union strikes Leads to less productivity as one of the major impact on containerization at DP World, 20% say yard capacity overflow, 18% say operational hindrances and 8% Say others.

Table .6

Particulars	No. of respondents	Percentage
ZODIAC	43	72
SPARCS	6	10
RFID	10	17
EXPRESS	1	1
Total	60	100

Table showing which is the terminal operating System used in Aspinwall

Interpretation

The above results show that 43% of employees are saying that zodiac is the Most commonly used terminal operating system used, 13% say rfid, 17% say Sparks and only 1% say express.

Table .7

Particulars	No. of respondents	Percentage
Yes	0	0
No	19	32
Soon to be implemented	41	68
Total	60	100

Table showing does Aspinwall company have Their own cfs

Interpretation

The above results show that 68% of the employees said that Aspinwall Company will be soon setting up their own cfs and 32% said that the company Doesn't own any cfs.

Table .8

Particulars	No. of respondents	Percentage
Gate	29	48
Vessel	25	42
Rail	6	10
Total	60	100

Table showing in which sector does Containerization play a major role in Aspinwall

Interpretation

The above results show that 48% of employees are saying that Aspinwall plays A major role in the gate sector, 42% say its vessel and 10% say rail.

Table .9

Particulars	No. of respondents	Percentage
Yes	0	0
No	60	100
Total	60	100

Table showing does Aspinwall have their owns Containers

Interpretation

The above results show that 100% of the employees have said that Aspinwall doesn't own any containers.

Table .10

Particulars	No. of respondents	Percentage
ITV	29	48
CFS	10	17
Employees	21	35
Total	60	100

Table showing what are the various Outsourcings done in Aspinwall for the Containerization process

Interpretation

The above results show that 48% of employees are saying that more outsourcing For the containerization process in Aspinwall is for itv, 35% say its for employees And 17% say its cfs.

Table .11

Particulars	No. of respondents	Percentage
MAERSK	22	37
MSC	18	30
EVERGREEN	11	18
TIS	9	15
Total	60	100

Table showing who all are the major clients of Aspinwall

Interpretation

The above results show that 37% of the employees are saying that maersk is one of the major clients of Aspinwall, 30% say msc, 18% say evergreen and 15% Say tis.

Table .12

Particulars	No. of respondents	Percentage
Yes	37	62
No	23	38
Total	60	100

Table showing does Aspinwall ensure security To the containers

Interpretation

The above result show that 62% of the employees said that Aspinwall ensures Security to containers and 38% disagree.

Table .13

Particulars	No. of respondents	Percentage
Dry containers	33	55
Reefer containers	16	27
Tanker	7	12
Other	4	6
Total	60	100

Table showing which is the most common type Of containers handled at aspinwall

Interpretation

The above results show that 55% of employees say that dry containers are the most Commonly handled container at Aspinwall, 27% say reefer, 12% say tanker and 6% Say others.

Table .14

Particulars	No. of respondents	Percentage
40ft	28	47
45ft	14	23
20ft	12	20
50ft	6	10
Total	60	100

Table showing what about the container Standards that are most commonly dealt by the company

Interpretation

Above results show that 47% of the employees are saying that 40ft is the most Commonly dealt with container standard at Aspinwall, 23% say 45ft, 20% say 20ft and 10% say 50ft.

Table .15

Particulars	No. of respondents	Percentage
Yes	41	68
No	19	32
Total	60	100

Table showing is their proper yard Management for containers at Aspinwall

Interpretation

The above results show that 68% of the employees say there is proper yard Management at Aspinwall and 32% say there is no proper yard Management at Aspinwall.

Interpretation

The above results show that 68% of the employees say there is proper yard Management at Aspinwall and 32% say there is no proper yard Management at Aspinwall.

Findings

- There is proper yard management for containers in Aspinwall
- They don't have their own CFS.
- Cross verification of outsiders are done in a strict manner.
- Class 1 and Class 7 goods are not handled at Aspinwall.
- All processes are done in systematic manner.
- They are providing more importance to safety.
- They have a separate engineering department to take care of their equipment.
- Gate pass is compulsory for entering inside the company.
- Adequate facility for handling all types of containers.
- The geographical location is useful in the transshipment.
- Aspinwall company does not have their own Containers

Suggestions

- Proper RFID system needs to be implemented.
- Company's website should be made more dynamic.
- Company should establish their own CFS.
- Make arrangement for scanning the container physically.
- Advertisements play vital role in every industry. So, the company should make
- advertisement with the changing preferences of the customers.
- The management should focus on social works, so that the company get good
- support from the public.
- Company should place one explosive detector in the main gate.
- Company should use the railway as a mode of transportation for its containers

- which would reduce the overall logistic cost.

Conclusions

This project in Aspinwall & Co Ltd, Cochin was helpful to know about the over-all working. This study was helpful to know the potential of organization and who they utilized the resources to gain the market strength. The project program gave me an excellent exposure to learn about the core aspects in the Container Freight Stations and the Shipping Industry and also to work with Aspinwall & Co Ltd which helps to gain knowledge in logistics operation and the operational challenges faced by the company. Over-all cargo handling is increasing year by year, but this was due to increase in the import of cargo. Many of the Container Freight Stations, they provide the import container clearance operations for a reasonable price, but the service quality of them differs and it affects the logistics operations.

Online and website reference

- <http://www.aspinwall.com/portal/page/portal/ASPINWALL>
- <http://www.containerization.com>
- <http://www.logisticsmgmt.com>
- <http://www.portfinanceinternational.com>

Magazines

- Liya.C.A.(2014). Socio economic impact of displacement A study of Container Terminal, Kochi.
- Joseph.P.S.& Manoj.P.K.(2015). International Container Transshipment Terminal, Kerala: A SWOT Analysis .International journal of logistics & supply chain management perspectives.1943-1947.

A Study on Service Quality and Customer Satisfaction in Telecom Sector with Special Reference to Mobile Phone Services in Ernakulam District

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Abstract

The study analyzed service quality dimensions in mobile phone services and their impact on customer satisfaction in Ernakulam district, Kerala, India, using a quantitative research design with a self- designed questionnaire completed by 130 respondents. Five service quality dimensions (tangibility, reliability, responsiveness, empathy, assurance) and six customer satisfaction factors (communication, call service, price, customer care, facilities, value-added services) were evaluated, all showing mean values above 3, indicating satisfactory performance. Tangibility emerged as the strongest dimension, while call service had the highest mean rating and lowest standard deviation, signifying consistent customer satisfaction. Significant differences were observed between service providers: Airtel and Jio users reported higher satisfaction, whereas BSNL users had the lowest ratings. The findings emphasize the need for service providers to improve service quality, address pricing concerns, and enhance empathy and responsiveness to foster customer loyalty.

Keywords: Service Quality, Customer Satisfaction, Mobile Telecommunications,

Introduction

The telecommunications industry has experienced remarkable growth and transformation over the past few decades, driven by technological advancements and the increasing demand for mobile communication services. Since the 1990s, this sector has emerged as an influential force, contributing significantly to the technological, economic, and productive growth of developed economies. The industry is divided into fixed and mobile branches, with the latter experiencing substantial growth due to the rapid adoption of cellular phones and mobile technologies.

The surge in demand for both private and business telecommunications services can be attributed to the crucial role these services play in supporting the rapid socio-economic growth and modernization of various sectors of the economy. As customer preferences continue to evolve in tandem with technological advancements, the industry strives to offer a wider and more innovative range of services to meet these evolving needs. Consequently, emerging markets have witnessed an influx of skilled and competitive players attracted to the lucrative opportunities within the telecommunications industry.

In the service sector, the quality of service provided by telecommunication companies is of paramount importance. Customers not only seek value for their money but also expect seamless communication and high levels of satisfaction from their mobile service providers. Customer satisfaction is determined by the customer's attitude or feeling after using the service – if the service meets their expectations, they are satisfied; if it falls short, they are dissatisfied. It is therefore crucial for mobile service providers to prioritize customer satisfaction and loyalty as part of their retention strategies in this highly competitive market. In India, there are mainly 4 service providers namely

1. Bharti Airtel Ltd
2. Bharat Sanchar Ltd [BSNL]
3. Reliance JIO
4. Vodafone Idea Ltd [V!]

Review of Literature

Service quality and customer satisfaction in the telecommunications industry have been extensively studied due to the sector's significance and competitiveness. Karunaratna (2022) developed the CCAAT model, comprising five dimensions (credibility, coverage, assurance, access, and tangibility) to measure service quality of mobile phone service providers and its effect on customer satisfaction. Kumar et al. (2021) found that service quality and product price significantly impact customer satisfaction in Bangladesh's telecom sector, while organizational factors had no effect.

Several studies have examined the relationship between service quality, customer satisfaction, and customer loyalty. The National Economics University, Hanoi, Vietnam & Et Al. (2021) revealed that both service quality and customer satisfaction positively influence customer loyalty, with service quality playing a more crucial role, especially the "customer services and pricing structure" dimension. Masoud (2020) confirmed the multidimensional nature of service quality, with functional (reliability, assurance, responsiveness) and technical (network quality) dimensions predicting customer satisfaction in the UAE.

Akroush et al. (2019) compared SERVQUAL dimensions across Jordan and Yemen, finding reliability as the most important predictor of customer satisfaction in both countries. Chitura et al. (2019) identified network performance as the key technical quality dimension impacting service quality and customer satisfaction in

Zimbabwe. Timothy (2017) found a positive relationship between service quality, SERVQUAL reliability dimension, customer satisfaction, and switching intention among Nigerian mobile users.

Lekobane & Selelo (2017) utilized the SERVQUAL model and reported that assurance, credibility, security, and tangibles significantly influence customer satisfaction in Botswana's mobile sector. Dharmadasa & Gunawardane (2017) revealed empathy, tangibles, and reliability as major service quality dimensions impacting customer satisfaction in Sri Lanka's mobile industry. Tulu (2015) highlighted network-related issues as significant challenges faced by mobile users in Ethiopia.

Ogunbade (2015) examined the effect of service quality, price perception, brand image, and value offers on customer satisfaction and loyalty, concluding that customer satisfaction alone cannot lead to loyalty without trust. Rajput & Bansal (2022) found responsiveness and empathy as significant predictors of customer loyalty, while Prabhakar (2013) emphasized the mediating role of communication in the service quality-customer satisfaction relationship.

Khan & Afsheen (2012) identified price fairness, customer service, and coverage as major determinants of customer satisfaction in Pakistan's telecom industry. Ahmed (2010) focused on the SMS service and reported tangibles, assurance, responsiveness, and reliability as positively related to customer satisfaction and retention intentions.

This literature review highlights the multidimensional nature of service quality, the importance of various dimensions in predicting customer satisfaction and loyalty, and the need for telecom providers to prioritize service quality improvement strategies to enhance customer retention and satisfaction.

Statement of the Study

The mobile telecommunications sector is a vital service industry for any country. Its ability to provide high-quality services and ensure customer satisfaction is key to the nation's growth and long-term development. This study aims to analyse the various dimensions of service quality in mobile phone services and evaluate how they impact customer satisfaction.

Objectives of the Study

- To assess the service quality dimensions of mobile phone users.
- To examine customer satisfaction towards mobile phone services.

Hypothesis

Ha1: There is significant difference between Service Providers and Service Quality.

Ha2: There is significant difference between Service Providers and Customer Satisfacti

Methodology

This study employed a quantitative research design to investigate the relationships between service quality dimensions, customer satisfaction, and customer loyalty in the Indian mobile telecommunications industry. The research aimed to gather primary data from consumers of mobile phone services in the Ernakulam district.

Population and Sampling

The target population for this study comprised consumers of mobile phone services in Ernakulam. A convenience sampling technique was used to select the sample participants due to the accessibility and feasibility considerations. The final sample size consisted of 130 respondents.

Data Collection

Both primary and secondary data sources were utilized in this study.

Primary Data: A self-designed questionnaire was used to collect primary data from the sample respondents. The questionnaire was administered through a survey method to gather information related to service quality perceptions, customer satisfaction, and customer loyalty towards mobile service providers.

Secondary Data: Secondary data was obtained from various sources, including research papers, journals, newspapers, magazines, and relevant online resources, to support the literature review and provide contextual information about the Indian mobile telecommunications industry.

Analysis and Interpretations

Table 1 Service Quality Dimensions in Mobile Phone Services

Service Quality Dimensions	Numbers of Items	Mean	Standard Deviation
Tangibility	3	3.65	0.8343
Reliability	5	3.47	0.8809
Responsiveness	6	3.52	0.9628
Empathy	7	3.44	0.8893
Assurance	6	3.49	0.8418

(Source: Primary Data)

Based on the data presented, all the service quality dimensions exhibit mean values above 3, indicating a satisfactory level of performance. The tangibility dimension has attained the highest mean value of 3.65, suggesting that the service provider excelled in delivering tangible aspects such as physical facilities, equipment, and personnel appearance. The responsiveness, assurance, and reliability dimensions

have achieved mean values of 3.52, 3.49, and 3.47, respectively, indicating a commendable level of prompt service, assurance, and dependability. However, the empathy dimension has garnered the lowest mean value of 3.44, implying potential areas for improvement in providing caring and individualized attention to customers.

Regarding the variability of responses, the tangibility dimension exhibits the lowest standard deviation of 0.8343, signifying a relatively consistent perception among respondents. The assurance, reliability, and empathy dimensions have standard deviations of 0.8418, 0.8809, and 0.8893, respectively, indicating moderate variability in responses. Notably, the responsiveness dimension has the highest standard deviation of 0.9628, suggesting a more diverse range of opinions regarding the promptness of service delivery.

Overall, the service provider has demonstrated satisfactory performance across all dimensions, with tangibility emerging as a strength, while empathy presents an opportunity for further enhancement. The standard deviation values indicate varying levels of consistency in customer perceptions, with responsiveness exhibiting the highest variability. These findings can serve as a valuable reference for service quality improvement initiatives and strategic decision-making processes within the organization.

Table 2 Customers Satisfaction towards mobile phone service

Customer Satisfaction	Number of Items	Mean	Standard Deviation
Communication	6	3.6550	0.87381
Call Service	3	3.7752	0.80597

Price	6	3.5284	0.86078
Customer Care	5	3.5457	0.86485
Facilities	8	3.6793	0.80796
Value Added Services	5	3.6992	0.87218

(Source: Primary Data)

The analysis of customer satisfaction factors reveals that all the factors have a mean value above the neutral rating of 3, indicating overall customer satisfaction. The call service factor attained the highest mean rating of 3.7752, suggesting customers were most satisfied with this aspect. Value-added services (mean = 3.6992), facilities (mean = 3.6793), communication (mean = 3.6550), and customer care (mean = 3.5457) followed in descending order of satisfaction. The price factor received the lowest mean rating of 3.5284, implying relative dissatisfaction compared to other factors.

An examination of the standard deviations unveils that the call service factor exhibited the lowest value of 0.80597, indicating a high degree of consensus among respondents' ratings. Facilities (SD = 0.80796), price (SD = 0.86078), customer care (SD = 0.86485), and value-added services (SD = 0.87218) demonstrated moderately dispersed ratings. In contrast, the communication factor had the highest standard deviation of 0.87381, suggesting a wider range of customer opinions.

The call service factor's combination of the highest mean rating and lowest standard deviation signifies that customers were consistently satisfied with this aspect of the service. This finding underscores the importance of maintaining and enhancing call service quality to ensure sustained customer satisfaction.

Testing of Hypothesis

Hypothesis 1

H0: There is no significant difference between Service Provider and Service Quality. H1: There is significant difference between Service Provider and Service Quality.

Table 3 Testing of hypothesis 1

ANOVA

Service providers	N	Mean	SD	F - Value	P - Value
BSNL	12	2.7890	0.9395	6.804	0.000*
Airtel	44	3.7084	0.6748		
Vi	31	3.2927	0.8265		
Jio	43	3.6947	0.6382		

Note: * denotes significant at 1 percent

Since P value is less than 0.01 we reject the null hypothesis, the null hypothesis is rejected at 1% level of significance hence concluded there is significant difference between the service providers regarding the service quality. Based on the mean score it is clear that Airtel users have better opinion regarding the service quality than othertelecom users that is 3.7084. Jio and Vi users with mean score of 3.6947 and 3.2927 respectively. BSNL users have worse opinion regarding the service quality that is 2.7890.

Hypothesis 2

H0: There is no significant difference between Service Provider and Customer Satisfaction. H1: There is significant difference between Service Provider and Customer Satisfaction

Table 4 Testing of hypothesis 2

ANOVA

Service Provider	N	Mean	SD	F - Value	P - Value
BSNL	12	2.9626	0.9719	7.499	0.000*
Airtel	44	3.7982	0.6686		
Vi	31	3.3797	0.7389		
Jio	43	3.8818	0.6244		

Note: * denotes significant at 1 percent

Since P value is less than 0.01 we reject the null hypothesis, the null hypothesis is rejected at 1% level of significance hence concluded there is significant difference between the service providers regarding customer satisfaction. Based on the mean score it is clear that Jio users better opinion regarding customer satisfaction than other telecom users that is 3.8818. Airtel and Vi users with mean score of 3.7982 and 3.3797 respectively. BSNL users have worse opinion regarding customer satisfaction that is 2.9626.

Findings and Discussions

The study yielded insightful findings regarding service quality dimensions and customer satisfaction factors in the Indian mobile telecommunications industry. All service quality dimensions, including tangibility, reliability, responsiveness, empathy, and assurance, exhibited mean values above 3, indicating satisfactory performance. Notably, the tangibility dimension emerged as the strongest aspect, suggesting that the service provider excelled in delivering tangible elements such as physical facilities, equipment, and personnel appearance. However, the empathy dimension garnered the lowest mean score, highlighting an opportunity for improvement in providing caring and individualized attention to customers.

An analysis of the standard deviations revealed varying levels of consistency in customer perceptions across different dimensions. While tangibility exhibited the lowest standard deviation (0.8343), implying relatively consistent opinions, responsiveness had the highest standard deviation (0.9628), suggesting a more diverse range of views regarding the promptness of service delivery. These findings underscore the importance of addressing potential inconsistencies and ensuring consistent service quality across all dimensions.

Regarding customer satisfaction factors, all factors, including communication, call service, price, customer care, facilities, and value-added services, achieved mean values above 3, indicating overall customer satisfaction. Notably, the call service factor emerged as the most satisfactory aspect, attaining the highest mean rating (3.7752) and the lowest standard deviation (0.80597). This combination signifies consistent customer satisfaction with the call service quality, underscoring its crucial role in fostering overall satisfaction.

Conversely, the price factor received the lowest mean rating (3.5284), implying relative dissatisfaction compared to other factors. This finding highlights the need for service providers to reevaluate their pricing strategies and ensure competitive and value-driven offerings. Furthermore, the communication factor exhibited the highest standard deviation (0.87381), suggesting a wider range of customer opinions and the potential for improvement in this area.

The study also revealed significant differences in service quality and customer satisfaction perceptions among users of different service providers. Airtel and Jio users reported higher levels of satisfaction with service quality and overall customer satisfaction, while BSNL users had the lowest ratings for both aspects. These findings emphasize the importance of service providers continuously

monitoring and enhancing their service quality and customer satisfaction initiatives to remain competitive and meet evolving customer expectations.

Conclusions

The study provides valuable insights into service quality dimensions and customer satisfaction factors in the Indian mobile telecommunications industry. While the service provider demonstrated satisfactory performance across all dimensions, tangibility emerged as a strength, and empathy presented an opportunity for improvement. Customers were consistently satisfied with the call service aspect, emphasizing its importance in ensuring overall satisfaction. However, the price factor received relatively lower ratings, indicating the need for service providers to reevaluate their pricing strategies.

The findings highlight the multidimensional nature of service quality and customer satisfaction, with varying perceptions across different aspects. Service providers should prioritize maintaining and enhancing service quality, particularly in areas such as empathy and responsiveness, to foster customer satisfaction and loyalty. Furthermore, addressing pricing concerns and offering value-added services could contribute to improved customer satisfaction.

The study also revealed significant differences in service quality and customer satisfaction perceptions among users of different service providers. Airtel and Jio received higher ratings, while BSNL lagged behind, suggesting the need for strategic improvements in service quality and customer satisfaction initiatives by BSNL.

References

1. Ahmed, I. (2010). Service quality, customer satisfaction and loyalty: A study of SMS service. *Research Anthology on Prospects of Employee Engagement, Satisfaction, and Motivation*.
2. Akroush, M. N., Samawi, G. A., & Omoush, M. M. (2019). Determinants of customer satisfaction and retention in mobile service providers: An empirical study of mobile service customers in Jordan and Yemen. *Journal of International Consumer Marketing*, 31(5), 425-459.
3. Chitura, T., Chingombe, A., Mavesere, I., Mupemhi, S., Moyo, T., & Shoniwa, T. (2019). Technical service quality and customer satisfaction in mobile telecommunication services. *International Journal of Applied Engineering Research*, 14(9), 2082-2089.
4. Dharmadasa, C., & Gunawardane, P. W. N. (2017). Exploring the importance of service quality for mobile telecommunications in Sri Lanka. *International Research Conference on Management and Finance*, 3, 30-41.
5. Khan, I., & Afsheen Khawaja, A. (2012). Factors affecting customer satisfaction: A study on telecommunication service providers in Pakistan. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 2(3), 293-308.
6. Lekobane, K. R., & Selelo, T. K. (2017). Determinants of customer satisfaction with mobile services in Botswana. *African Journal of Business and Economic Research*, 12(2&3), 255-272.
7. Masoud, S. (2020). The impact of service quality on customer satisfaction in the UAE mobile telecommunication sector. *International Journal of Quality & Reliability Management*, 37(7), 1135- 1158.

8. Ogunbade, O. I. (2015). Service quality, price perception, brand image and customer satisfaction: An analysis of the Nigerian telecommunication industry. *International Journal of Management Practice*, 8(1), 31-54.
9. Prabhakar, A. C. (2013). Study of service quality and customer satisfaction in telecommunication service sector in India. *International Journal of Management Research and Reviews*, 3(2), 2421.
10. Rajput, A., & Bansal, S. (2022). Effects of service quality on customer loyalty in Indian telecom industry. *International Journal of Research in Management and Business Studies*, 9(1), 40-44.
11. The National Economics University, Hanoi, Vietnam, Trung, N. K., Le Tuan, L., Thuy Hang, N., & Xuan Soo, D. (2021). The effects of service quality and customer satisfaction on customer loyalty: A comparative study among different levels of Vietnam telecommunications service providers. *Management Science Letters*, 11(9), 2657-2666.
12. Timothy, A. O. (2017). Impact of service quality dimensions on customer satisfaction and switching intention in Nigerian mobile telecommunication industry. *Journal of Economics and Management*, 30(4), 40-65.
13. Tulu, B. W. (2015). Network quality and service quality perceptions for mobile telecommunications in Ethiopia. *African Journal of Business and Economics*, 10(2), 29-62.

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