IIT Madras
BS Degree

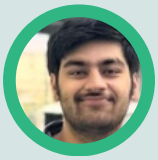
Strategies For Professional Growth

FINAL REPORT

ENGINEERING MANAGEMENT :

“Transforming the Engineering Space: The Impact of Generative AI (gen AI) and Deep Learning(DL) on Team Dynamics, Work Ethics, Conflict Resolution and Business Decisions."

Prepared by :



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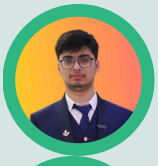

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Contents

Introduction and Objectives

The rise of Generative AI over the last few years has significantly transformed the world in many aspects. While some perceive this as a symbol of growth and progression others have argued over the legitimacy and ethical aspects of AI use. Through this project we have explored the role and impact of AI in the following aspects:

- Analyze the Integration of gen AI in transforming traditional Engineering. **Investigate**
- **on Changes in Team Dynamics** - How gen AI tools affect communication, hierarchy, and productivity within engineering teams **Evaluate Ethical Implications** -To guide
- responsible practice in the ethical implications of AI in engineering . **Impact on Professional Skills and Conflict Resolution** - Identify necessary professional
- development paths and Develop skills in identifying, managing, and resolving conflicts for engineers to stay relevant in an AI-integrated job market. **Business Decision-Making and Strategic Acumen** - To analyze how AI can influence business strategies
- and operational decisions

Methodology Description

Data Collection

Primary Data Collection:

Interviews:

- Conducted structured interviews with professionals across sectors like Human Resources, Consulting, IT, E-Commerce, Transportation, and Hospitality.
- Focus areas included AI's impact on business decisions, productivity, conflict resolution, and ethical considerations.

Survey:

- Deployed a simple random sampling survey via Google Forms starting July 1, 2024. Targeted working
- professionals to gauge AI's influence on business decisions, productivity, conflict resolution, and ethical concerns. Disseminated through LinkedIn, WhatsApp,
- Google Spaces, Discourse, and Instagram.

Secondary Data Collection:

Research Papers:

- Top research papers on AI's impact were identified using Google Scholar, Research Gate, etc.
- Papers were selected based on their relevance to the study's objectives and were thoroughly reviewed to extract pertinent insights.

Other Sources:

- Supplementary data were gathered from various YouTube videos, books, and movies that provided additional perspectives on AI's impact on business and society.

Data Analysis & Investigation

Quantitative Analysis:

Statistical Methods:

- Utilized descriptive statistics to summarize the survey data, including measures of central tendency (mean, median) and dispersion (standard deviation, variance).

Data Visualization:

- Created visualizations such as pie charts, bar graphs, and proportions to represent the survey data clearly.
- Developed word clouds to highlight common themes and sentiments expressed in the open-ended survey responses.

Qualitative Analysis:

Sentiment Analysis:

- Performed sentiment analysis on the subjective feedback from the Google Forms survey and interview responses.

Thematic Analysis:

Compiled findings from secondary resources into a comprehensive document.
Conducted multiple brainstorming sessions to identify key themes and draw conclusions from the collected data.

Conclusion Synthesis:

Integration of Findings:

- Merged insights from primary and secondary sources to form cohesive conclusions.
- Focused on ethical implications and proposed mitigation strategies.

Recommendations:

- Provided actionable recommendations to optimize AI integration while upholding ethical standards.
- Suggested frameworks for continuous monitoring and evaluation of AI's impact.

Primary Research - Interview Feedback

Mr. Vardhman Jain
by Aryan Tiwari

Mr. Vardhman Jain, a cloud engineer at Wells Fargo, highlighted generative AI's role in coding, security, and infrastructure, emphasizing ethical use, effective prompt writing to maximize the output, and foundational skills. AI enhances productivity and team communication and task management but requires careful access control.

Mr. Gurudev Murugan
by Uroosha Rahat

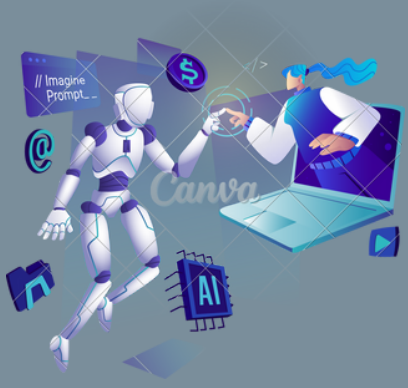
Mr. Gurudev Murugan , Data Scientist at ICCW highlighted how AI enhanced data comprehension and helped overcome language barriers in a project in North India. He emphasized the importance of AI based courses in education.He also advised engineers to diversify their skill sets to survive and thrive in the AI integrated job market.

Mr. Lovleen Chadha
by Shubham Sharma

Mr. Lovleen Chadha - Cofounder & CTO qapp.ai Lovleen Chadha emphasized the ethical and privacy implications of AI, particularly in accessing personal data and recording conversations. He advocated for transparency, accountability, and clear guidelines to address data privacy. He also highlighted the need for tools to alert users about recordings and AI-generated decisions. He noted AI's limited impact on business strategies and the challenges of adopting AI technologies, stressing the importance of openness to new ways of working. He asserted that layoffs due to technological advancements were not inherently unethical, but ethical considerations lay in how companies handled and supported affected employees.

Mr. Chander Mohan
by Sayan Hrik

Mr. Chander Mohan , Retired Scientist G at the Ministry of Science and Technology at the Government of India, highlighted that the rise of AI, machine learning, and Big Data led to increased data leaks and privacy breaches. He emphasized the importance of GDPR (General Data Protection Regulation principles formed at the European Union) to ensure ethical AI-driven tasks and business decisions, preventing detrimental impacts. GDPR mandates strict data protection measures and grants individuals control over their personal data, ensuring transparency and accountability.



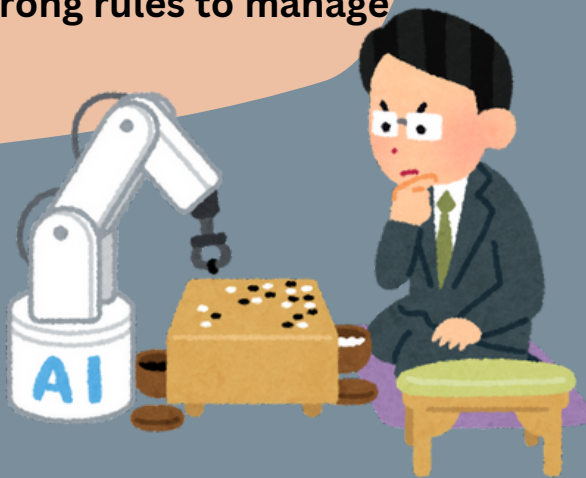
Primary Research - Interview Feedback

Mr. Venu Ganapuram
by Avijeet Palit

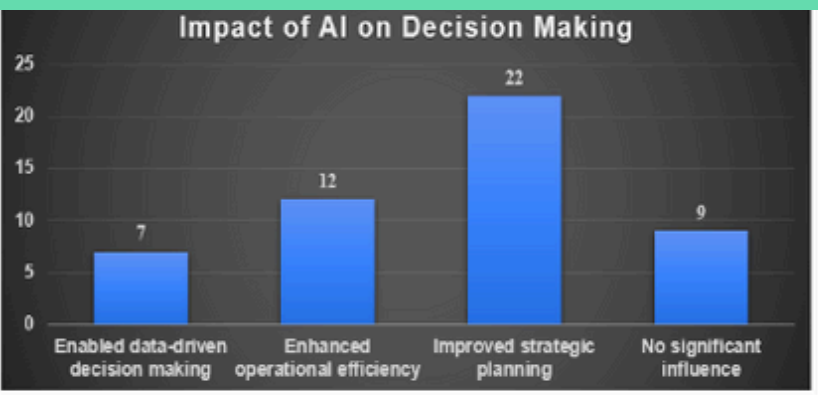
Mr. Venu Ganapuram, Senior Principal Scientist at CSIR - National Aerospace Laboratories, elucidated the transformative impact of Generative AI on engineering. He emphasized AI's potential to reduce reliance on proprietary software and enhance team dynamics through upskilling. He highlighted the importance of ethical AI, data privacy, and algorithmic fairness. He advocated for multidisciplinary competencies and predicted a shift towards virtual simulations and digital twins. He also discussed AI's influence on strategic decision-making and increasing operational efficiency by simplifying tasks, and the need for empathetic team building through gamification and flexible work paradigms. He stressed the role of academia in bridging the AI skills gap and the need for a holistic approach to AI integration balancing technical and human centric approaches.

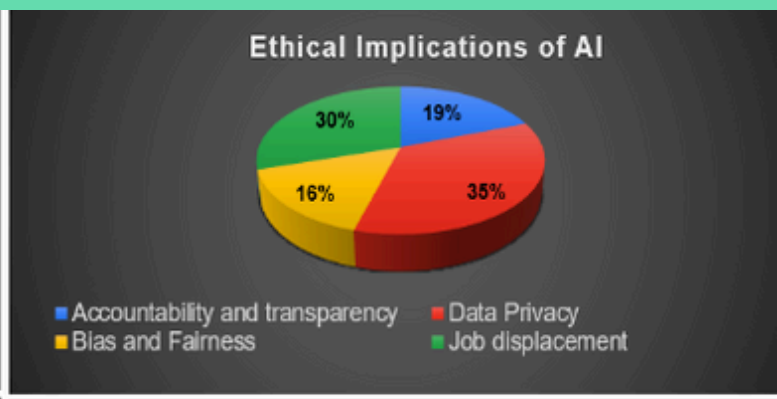
Ms. Aishyan Narang
by Sourav Sharma

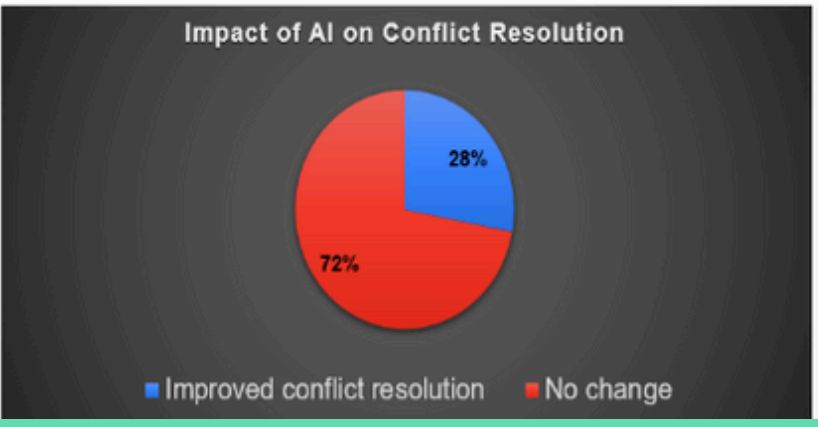
Ms. Aishyan Narang, a Junior Data Scientist at Bancapp Automation, talked about how AI and deep learning help businesses make better decisions. These technologies provide detailed insights into market trends, customer behavior, and how well a company runs. As AI takes over more tasks, engineers need to learn new skills, like understanding AI and working in different areas. Aishyan highlighted the importance of including ethical considerations in AI strategies to match company values. She mentioned that these technologies are changing work ethics because teams need to ensure AI decisions are fair and accountable. She stressed that businesses should be open about their use of AI and create strong rules to manage AI projects.

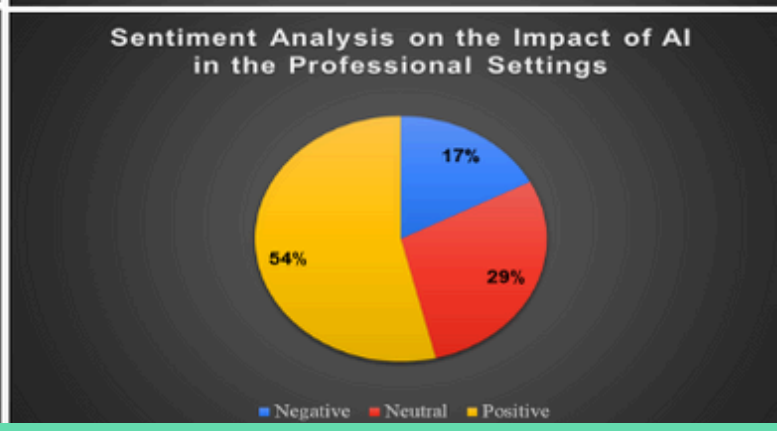


Survey Analysis









- Sentiment analysis on the feedback collected through the survey shows that 54% of the professionals interviewed have found AI to be productive and useful in terms of increasing efficiency , optimizing business decisions , resolving conflicts and managing organizational operations.

- The remaining individuals have cited concerns over the rise in AI pointing out to ethical aspects primarily including Data Privacy breaches (35%) , job displacement issues (30%) and transparency in operations carried out using AI(19%).

- The survey target audience also included school and university teachers who have had a negative perspective over the use of AI which has led to students using unfair means to pass examinations and assignments. This has significantly damaged the ethical values of fairness , hard work and determination in today's youth.

- The survey shows that AI has significantly contributed to making successful business decisions by boosting strategic planning, enhancing operational efficiency and driving data driven decisions.

- Approximately 17% of the individuals feel that AI has not significantly impacted their business decisions and hasn't affected their spheres of conflict resolution , team management and emotional intelligence. 48 percent of the people in this category belonged to the transportation and hospitality industry.

Analysis of Secondary Resources

Books

Human + Machine: Reimagining Work in the Age of AI by Paul R. Daugherty & H. James Wilson explains how AI can be transformative in business operations. AI is facilitating unprecedented AI-human collaboration, supporting more flexible and adaptive operations. The authors emphasize AI is not poised to eliminate human jobs, but rather make them more efficient with the use of tools.

- The book cites comprehensive examples of Hitachi which uses AI to analyze data and optimize worker instructions.
- Goldman Sachs which uses AI to identify key share price factors to boost profitability.
- Johnson & Johnson which uses Watson AI to expedite drug discovery.

Movies

- The Matrix, a 1999 sci-fi movie shows the importance of ethical guidelines in AI development to prevent control over humans. Additionally, it explores the blurred lines between reality and simulation, paralleling the challenge of distinguishing real data from AI-generated content.

- Blade Runner 2049" (2017) follows K, a replicant blade runner, uncovering a secret that could disrupt society. The film explores AI's impact on team dynamics, work ethics and conflict resolution by showing how humans and AI can interact impacting important business decisions while also pointing out instances of clashes amongst individuals that occur due to AI. The movie also shows how company choices about using cutting-edge AI tech can be risky and raise ethical questions.

YouTube Webinars

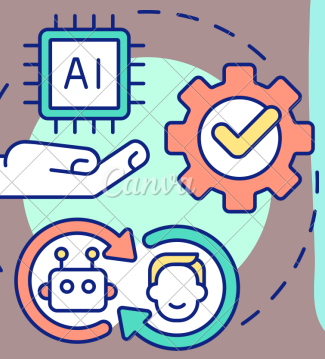
1. Generative AI offers numerous opportunities in software engineering and acquisition, including code generation, documentation, testing, and discrepancy analysis.
2. Generative AI can boost productivity across a range of tasks: The technology offers the potential to significantly increase efficiency in various areas, from summarizing documents and transcribing notes to even controlling HVAC systems.
3. AI's increasing prevalence in financial decision-making raises concerns about potential biases and the risk of spoofing.
4. AI can enhance data quality: AI can be used to identify outliers, incorrect values, and other data anomalies, helping to improve the overall quality of data used for decision-making.
5. The future of AI is collaborative: AI is not replacing human decision-makers; rather, it is becoming a powerful tool for brainstorming, generating ideas, and providing insights. The most effective approach is to view AI as a collaborative partner, leveraging its strengths to enhance human judgment.

Research Papers

- In a study by Zinnov and Ness Digital Engineering, it was established that generative AI in software engineering can help save 38% of time for any task, 48% time for senior engineers, and can hasten the development cycles by 70%. It increases quality, reduces manual tasks, and lowers attrition, while at the same time likely reducing the need for junior engineers(Zinnov, 2024) .

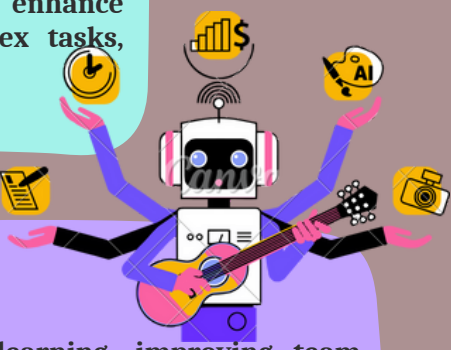
- In a Research article by Deloitte the author concluded that a successful AI adoption requires building trust in teams, improving data literacy, and using ethical AI through transparent communication. For effective integration, change management and reskilling are needed. Fears regarding AI must be dispelled through training and the building of trust. As specified by this study, business outcomes improve significantly when AI-driven, data-based decision-making is validated through continuous testing.(Deloitte, 2023)

Conclusions and Recommendations



Integration of Generative AI in Engineering Understanding Gen AI and Deep Learning Applications

1. Generative AI and Deep Learning boost engineering productivity by reducing task completion time by 38%, with senior engineers seeing a 48% improvement.
2. These technologies streamline code structures, enhance performance, and allow engineers to focus on complex tasks, necessitating workforce reskilling for domain expertise.



Changes in Team Dynamics

Effect on Communication

1. Gen AI tools enable seamless communication and personalized learning, improving team coordination through real-time feedback and enhanced information flow.
2. AI supports effective task management and collaboration by tailoring learning experiences, reducing misunderstandings, and fostering a more collaborative work environment.

Impact on Hierarchy

1. AI optimizes task distribution based on individual strengths, enhancing productivity and reducing bottlenecks, while flattening traditional hierarchies for a more dynamic team structure.
2. The democratization of information by AI fosters inclusivity and adaptability within teams, ensuring strategic task assignments and improved overall performance.

Influence on Productivity

1. AI tools automate routine tasks, streamline workflows, and provide actionable insights, leading to significant productivity gains and freeing up team members for higher-value activities.
2. Effective AI integration requires ethical guidelines to maximize benefits and maintain data integrity while improving team communication and task management.

Ethical Implications of AI

Privacy Concerns

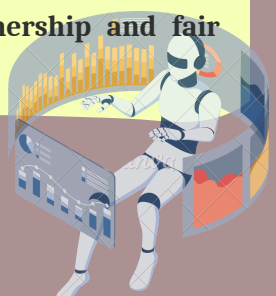
1. AI raises privacy issues, including data breaches and potential biases, necessitating transparency and adherence to regulations like GDPR to ensure responsible AI use.
2. Robust data protection measures and clear communication about data use are essential to build trust and address privacy concerns effectively.

Bias and Accountability

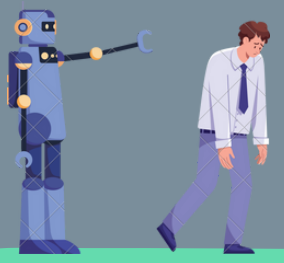
1. Addressing biases in AI systems requires transparency, regular audits, and adherence to ethical standards, ensuring fair outcomes and maintaining public trust.
2. Accountability measures include transparent reporting and clear guidelines to prevent discrimination and bias in AI applications.

Job Displacement

1. AI's automation of routine tasks necessitates reskilling and upskilling programs to help displaced workers adapt to new roles and remain relevant in the job market.
2. Strategies to support transitioning employees emphasize the human-AI partnership and fair treatment, aiming to minimize the negative impacts of AI on employment.



Conclusions and Recommendations



Impact on Professional Skills and Conflict Resolution

Professional Development Paths

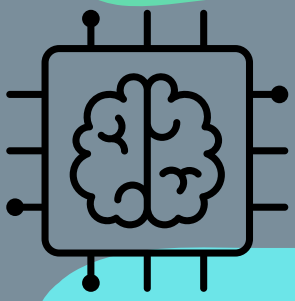
1. Engineers must pursue AI-based education and skill diversification to stay competitive, with programs covering AI fundamentals, ethics, and practical applications.
2. Continuous learning ensures engineers are equipped to leverage AI technologies effectively, driving innovation and maintaining a competitive industry edge.

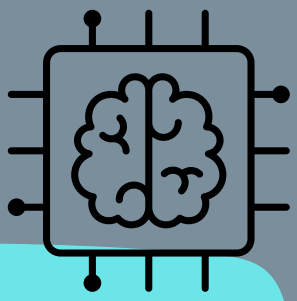
Improving Teamwork

1. AI tools enhance teamwork by analyzing interactions, suggesting improvements, and optimizing task assignments, leading to more effective project execution and higher-quality outcomes.
2. AI-driven insights support better strategic planning, promote transparency, and foster a collaborative environment, improving overall team performance.

Conflict Management

1. AI supports conflict management by providing data-driven insights and recommendations for constructive resolution, turning disputes into learning opportunities.
2. Professional development in conflict resolution, combined with AI support, helps engineers manage interpersonal challenges and maintain a harmonious work environment.





Business Decision-Making and Strategic Acumen

Data-Driven Decision-Making

1. AI enhances decision-making by analyzing historical data to provide actionable insights, improving problem-solving skills and confidence in business decisions.
2. Relying on data-driven insights minimizes risks and maximizes opportunities, leading to better business outcomes and a competitive market advantage.

Operational Efficiency

1. AI improves operational efficiency by automating tasks and optimizing workflows, as demonstrated by HSBC's AI use in anti-money laundering, reducing costs and increasing productivity.
2. The efficiency gains from AI enable organizations to allocate resources effectively and focus on strategic initiatives, achieving operational excellence.

Strategic Planning

1. AI supports strategic planning by providing accurate, timely insights for informed decision-making, helping organizations stay competitive and adapt to market changes.
2. Leveraging AI for market analysis and resource allocation ensures agility and innovation, positioning organizations for long-term growth and success.

Illustrations

Skill Augmentation

Enhanced Collaboration

Skill Complementation
Balanced Task Distribution
Expertise Enhancement
AI-enhanced Skills

Real-time Feedback
Idea Integration
AI-powered Collaboration
Teamwork Amplification

Decision Support

Data Analysis
Informed Decisions
Quick Decision-making

Transparency and Fairness

Efficiency vs. Job Displacement

Transparency
Unbiased AI
Fair Treatment

Productivity
Upskilling
Job Security

Accountability

Responsible AI Use
Integrity
Ethical Practices

Case Studies

Case 1

HSBC: Tackling Money Laundering (Impact of GenAI in business decisions / productivity)

Challenge: Anti-Money Laundering (AML) remains a considerable risk for financial institutions, and traditional detection approaches are starting to be overwhelmed with increased transaction volumes and AML sophistication.(DigitalDefynd, 2024)
Solution: HSBC adopted the AI system to improve its anti-money laundering (AML) efforts. This mechanism relies on sophisticated machine learning algorithms to detect anomalous patterns and illicit activities in a wide range of numbers, which can identify fraud more accurately than traditional approaches.
Overall Impact:

- **Improvement in Detection Rates:** The number of suspicious transactions caught is exponentially higher due to the AI system, mitigating financial crimes helped.
- **Fewer False Positives:** More accurate separation of knowns and unknowns to keep from inadvertently penalizing or picking on clean customers.

Case II

COMPAS : Examining Algorithmic Fairness in Predictive Policing (Ethical use of AI)

Challenge: COMPAS, a tool used to predict recidivism risk in the U.S. criminal justice system, faces scrutiny for potential racial bias. Traditional methods have struggled to address fairness concerns effectively.
Solution: COMPAS uses machine learning algorithms to evaluate factors such as criminal history and demographics to assess the risk of reoffending. However, its predictions have been criticized for racial disparities, with higher risk scores often assigned to Black defendants compared to white defendants.
Overall Impact:

- **Disparity in Risk Scores:** COMPAS has shown a tendency to disproportionately label Black defendants as high risk, even when their reoffending rates do not justify it.
- **Accuracy and Bias:** While generally accurate, the tool's predictions vary across racial groups, leading to concerns about fairness and effectiveness.

Project Review

Member	Task
Sayan Hrik	• Conducting interviews and analysis of survey data. • Identifying the problem statement and the research methodology and creating the dashboard from survey data. • Forming the team contract and project review and team personality profiles.
Uroosha Rahat	• Conducting interviews and analysis of YouTube videos. • Designing the poster. • Creating the project schedule and Work Breakdown Structure. • Creating the Dashboard.
Avijeet Palit	• Identifying problem statement objectives. • Interviews and analysis of research papers. • Compiling reports on Canva.
Shubham Sharma	• Creating the google form and questions for the survey. • Interviews and analysis of the remaining research papers. • Creating influence diagrams for GP 2.
Sourav Sharma	• Interviews and analysis of relevant movies. • Finding relevant research papers for the analysis .
Aryan Tiwari	• Writing citations for the reports. • Review of books and interviews. • Working on the case studies.