Proceedings of the International Conference on Industrial Engineering and Operations Management

Publisher: IEOM Society International, USA DOI: 10.46254/BA08.20250467
Published: December 20, 2025

Evaluating the Performance of Agile–Waterfall Integrated Approaches in Large Scale Engineering Projects in Bangladesh

Jubayer Ahamed, Abu Saleh Muhammod Alvy, Victor Stany Rozario, Md. Asraf Ali and Shamvi Md Abdullah
Department of Computer Science
American International University-Bangladesh
Dhaka, Bangladesh
jubayer@aiub.edu, asmalvy03@gmail.com, stany@aiub.edu, asrafali@aiub.edu, shamvi.abdullah@gmail.com

Zeba Labiba
Department of Software engineering
Macquarie University
Sydney, Australia
zebalabiba17@gmail.com

Abstract

Engineering mega-projects in Bangladesh, including large bridges, highways and power plants are marked by significant complexity, changing requirements and recurrent environmental and logistical challenges. Conventional project management methodologies, particularly the linear Waterfall model, have historically been employed to oversee these projects owing to their systematic planning and adhering to regulations. The inflexibility of Waterfall frequently constrains adaptability throughout project implementation, resulting unexpected delays, rework, and coordination difficulties. Consequently, worldwide project management trends have evolved to integrate Agile concepts, which prioritize iterative feedback, stakeholder participation and adaptability to change. This study investigates the effectiveness of Agile-Waterfall hybrid methodologies relative to traditional Waterfall approaches in the context of mega-engineering projects in Bangladesh. A conceptual framework is presented to examine the impact of the selected project management methodology (independent variable) on three critical performance indicators: flexibility, quality and delivery time (dependent variables). The framework emphasizes the moderating impact of organizational culture, managerial proficiency, stakeholder communication and technical integration. Literature indicates that hybrid models can reconcile structure and adaptability by implementing iterative enhancements within established phases, hence improving responsiveness while upholding compliance and documentation standards. Nonetheless, significant obstacles such as slowness to change, insufficient Agile training, administrative delays and inconsistent digital readiness impede effective hybrid adoption in Bangladesh.

Keywords
Project Management, Agile-Waterfall, Conceptual Framework, Independent Variable, Dependent Variables.

1. Introduction
Engineering mega-projects in Bangladesh, including extensive bridges, motorways, power plants, and industrial infrastructures, are marked by considerable complexity, protracted schedules, and substantial uncertainty. These projects often encompass numerous contractors, changing stakeholder expectations, environmental obstacles, and

fluctuating regulatory demands. Conventional project management methodologies, particularly the Waterfall model, have historically been employed to oversee big engineering projects owing to their organized, linear framework and focus on documentation and preliminary preparation. Scholars have increasingly criticized the inflexibility of the Waterfall model, contending that its linear steps hinder adaptability to changes once implementation commences (Royce 1970). This constraint is especially problematic in Bangladesh, where large-scale projects encounter frequent design modifications, delays, and coordination issues. Consequently, global project management techniques have progressively transitioned towards more adaptable methodologies, particularly Agile. The Agile Manifesto highlights iterative development, collaboration with stakeholders, and adaptability to change (Agile Manifesto, 2001). Initially developed for the software sector, Agile principles have lately been modified for application in construction and engineering, providing project teams enhanced flexibility and expedited feedback loops. Agile practitioners emphasize that Agile's value is derived from its capacity to improve responsiveness and minimize rework through the facilitation of continuous communication and incremental advancement (Fowler 2001).

Worldwide, Agile–Waterfall hybrid models have demonstrated potential for increasing adaptability, boosting communication, and mitigating delivery risks in extensive, intricate engineering projects. However, in Bangladesh, the implementation and efficacy of these hybrid approaches remain little examined. Empirical evidence regarding the efficacy of hybrid approaches compared to traditional methods in terms of flexibility, quality, and delivery time is scarce. This gap generates ambiguity for policymakers, engineering managers, and contractors striving for improved project results.

This research is designed to evaluate the efficacy of Agile–Waterfall hybrid models in engineering mega-projects in Bangladesh and to contrast them with conventional Waterfall methodologies. A conceptual framework has been proposed in the methodology part of this study. This assessment is essential for policymakers, engineering firms and project managers pursuing evidence-based solutions to enhance performance outcomes in the nation's swiftly evolving infrastructure landscape.

1.1 Objectives

The research objectives are given below:

- To evaluate the success rate of Agile-Waterfall hybrid project management models in engineering mega-projects in Bangladesh relative to conventional Waterfall-based methodologies.
- Focuses on engineering mega-projects in Bangladesh. That includes rail, highway, bridge, power plant, and large govt-led infrastructure projects.
- Only compares Agile–Waterfall hybrid approaches with traditional Waterfall methods.
- To emphasizes performance metrics: flexibility, quality and delivery time.

1.2 Research Questions

1. How effective are Agile–Waterfall hybrid models in enhancing flexibility during the execution of engineering mega-projects in Bangladesh?
2. What framework can be proposed for optimizing hybrid methodology adoption in future mega-projects?
3. What challenges do engineering teams in Bangladesh face when implementing Agile–Waterfall hybrid models?

2. Literature Review

Engineering mega-projects are complicated, large-scale efforts that engage various stakeholders, extend over prolonged periods, require substantial financial input, and entail considerable uncertainty. Historically, project management in engineering depends on linear, plan-oriented methodologies like the Waterfall model. Nonetheless, increasing complexity, evolving requirements, and technology integration have prompted organizations to investigate more flexible methodologies. Hybrid Agile-Waterfall approaches have emerged as an effective solution, integrating the systematic planning of Waterfall with the adaptive flexibility of Agile. This chapter examines fundamental models, hybrid methodologies, implementation obstacles, and the significance of these models within the context of Bangladesh's mega-projects.

2.1 Analysis of Waterfall Model and Agile Project Management

The Waterfall model originated from the seminal work of Winston Royce in 1970, who introduced it as a linear methodology encompassing requirements, design, implementation, verification, and maintenance. Royce’s model

achieved extensive recognition in engineering, construction, and software development owing to its simplicity, methodical framework, and appropriateness for projects with predictable requirements (Royce 1970). In engineering mega-projects, the Waterfall model has numerous benefits like comprehensive initial planning, explicit documentation, delineated phases and conformity with regulatory and contractual standards. These attributes are especially significant in infrastructure building, where cost estimation, procurement, and compliance are paramount. Royce himself, on the other hand, advised that following precise sequential phases could be risky, especially if modifications happen while the project is being carried out. Engineering mega-projects often run into problems that weren't planned for, such not having enough materials, needing to revise the design, stakeholders needing to adjust, or environmental restrictions. This is when Waterfall's rigidity becomes a problem. The model's inability to handle continuous input or iterative changes makes things harder in situations where there is a lot of ambiguity and requirements change over time.

The Agile approach began with the manifesto (Agile Manifesto 2001), which was written by top practitioners looking for alternatives to heavy, document-driven techniques. The manifesto and remarks by Martin Fowler and his coworkers stressed four values: workable solutions above long documentation, customer collaboration, being open to change, and delivering in small steps. Agile's ideas were first used in software development, but the focus on flexibility, team communication, and iterative cycles has had an impact on project management in many fields. Agile has ways for teams to get immediate feedback, keep getting better, and plan in short cycles (sprints or iterations), which lets them quickly adjust to changing needs. In engineering, Agile has obvious limits. For example, physical building can't be "iterated" in the same way that software can. Even in construction and large-scale engineering settings, Agile methods like daily collaboration, incremental design validation, quick issue resolution, and stakeholder involvement can be very helpful.

2.2 Emergence of Hybrid Agile–Waterfall Models

Hybrid techniques have become increasingly popular among academics and practitioners as they have become aware of the limits of both pure Waterfall and pure Agile methodologies. The formal planning of Waterfall and the agility of Agile are both incorporated into these approaches. A conceptual hybrid model that incorporates Agile feedback loops into traditionally planned phases is proposed (Lalmi 2021), who made a significant contribution to the field. The study contends that hybrid models enable organizations to keep compliance and predictability while also reaping the benefits of iterative improvement while the execution is taking place (Lalmi 2021).

Another study introduced a hybrid project management model that was designed primarily for building projects (Fernandes 2023). This model was used in the construction industry. The research conducted by Fernandes highlights the fact that construction environments necessitate robust design and planning from the beginning of the process, which is a strength of the Waterfall methodology. However, Agile techniques, such as incremental design review, collaborative problem-solving, and flexible scheduling, are beneficial. In a similar manner, Sarah Maidin investigated the possibility of combining Agile Scrum and Waterfall to bring about a hybrid model that is appropriate for software engineering teams. Even though her findings were initially applied to software, they lend credence to larger conclusions. When Agile methods are implemented inside a structured phase-based model, teams experience increased communication, clearer prioritization and faster discovery of design mistakes.

2.3 Integrating Agile in Construction and Technology as an Enabler of Hybrid Approaches

Although Agile originated in software development, numerous researchers have explored its relevance to building and engineering. One of the studies examined the integration of Agile methodologies within the predominant Waterfall building process (John A. et al. 2025). The research indicated that the integration of iterative design evaluations, regular stakeholder consultations, and early issue identification markedly enhances adaptability to modifications and minimizes rework. Another work examined Agile methodologies primarily in the construction sector (Keyur Brahmbhatt 2021). Brahmbhatt emphasized that Agile improved communication among contractors, clients, and engineers, while also improving responsiveness to design alterations. He also acknowledged practical problems, including resistance to cultural transformation and the difficulties of implementing Agile in physically limited settings. Researchers conducted a comparative case study analyzing Waterfall and Agile methodologies in multifunctional projects (Khayyat et al. 2022). They determined that Agile-enhanced environments exhibit enhancements in flexibility and stakeholder satisfaction, whereas Waterfall programs display robustness in documentation and initial planning. Their findings substantiate the notion that hybrid methodologies may effectively reconcile these strengths.

The incorporation of digital technologies is essential for facilitating hybrid project management. A study showed the influence of Building Information Modelling (BIM) on project performance (Messner et al. 2017). Their research revealed that BIM facilitates iterative collaboration, early clash identification and enhanced communication attributes that strongly correspond with Agile concepts. Recent research (Wang 2024) investigated different levels of BIM utilization and discovered that increased adoption is associated with enhanced schedule performance, diminished errors, and superior quality outcomes. These findings suggest that technological solutions can mitigate deficiencies in conventional project management and facilitate more adaptable hybrid processes. Simulations, digital inspections, and scenario modelling are all aspects that are made possible by technology for engineering megaprojects. These characteristics make it easier to make iterative decisions while keeping the structured control that Waterfall provides.

2.4 Mega-Project Challenges and Relevance of Hybrid Models to Bangladesh

According to the research that has been conducted on Bangladesh's engineering megaprojects, there are recurrent problems that highlight the necessity of adopting more flexible procedures for project management. Several important causes that contribute to delays in Bangladesh's construction industry have been identified (Emon et al. 2019). These problems include a lack of resources, errors in coordination, delays in land acquisition and inadequate project monitoring. These problems frequently call for prompt adjustments, which is something that conventional models have difficulty supporting. One work conducted additional research on the factors that cause infrastructure projects to incur cost overruns and delays (Sharmin 2024). The results of their investigation show inefficiencies in planning, the complexity of procurement, delays connected to stakeholders, and changes in scope, all of which are conditions that ensure the necessity of flexibility and continual input. Case-specific research conducted by Rahman (Rahman 2022) on the Padma Multipurpose Bridge highlighted several obstacles that were encountered during the execution of the project. These challenges included environmental hazards, design adjustments, contractor capacity issues and political, social, and geotechnical uncertainty. In the engineering landscape of Bangladesh, where change occurs frequently and has a significant impact, these complications illustrate how inflexible sequential models may not be adequate.

Considering the evidence, hybrid Agile–Waterfall models offer a promising opportunity within the Bangladeshi context. Waterfall offers the essential framework for ensuring compliance, managing budgets, and facilitating large-scale coordination. Agile offers frameworks to adapt to unforeseen site conditions, modifications in late-stage designs, and evolving stakeholder requirements. The ongoing obstacles identified by Bangladeshi researchers such as delays, revisions, coordination failures and quality concerns that closely align with the issues that hybrid models seek to address. Furthermore, the growing adoption of technologies such as BIM enhances the viability of integrating Agile-inspired iterative processes into engineering workflows. Empirical research on hybrid models in Bangladesh is limited. This gap warrants a careful comparison of hybrid and traditional approaches to determine whether model promotes flexibility, quality, and delivery.

3. Conceptual Framework Architecture

In Figure 1, the proposed conceptual framework has been shown. This proposed framework demonstrates the impact of various project management methodologies, specifically the Agile-Waterfall Hybrid model compared to the Traditional Waterfall model, on the overall performance of engineering mega-projects in Bangladesh.

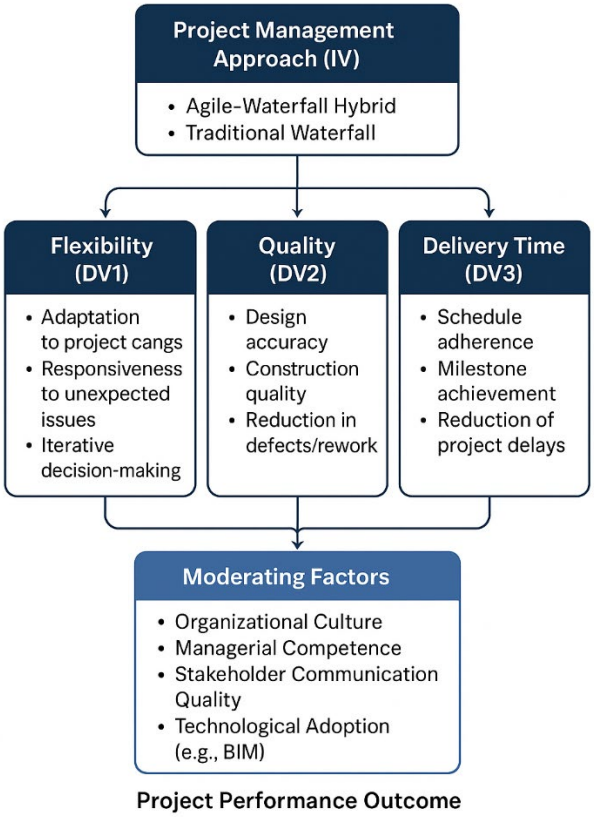

Figure 1. Proposed conceptual Framework

Within this approach, the Project Management Approach serves as the independent variable (IV), influencing variances across three principal characteristics of project performance: Flexibility, Quality, and Delivery Time, which jointly act as the dependent variables (DVs). These relationships do not function independently; rather, they are profoundly affected by various crucial moderating factors, including regulatory constraints, resource availability, political conditions, and stakeholder dynamics, which are especially pertinent in the context of Bangladeshi mega-projects.

The framework initiates by clearly differentiating the two project management methodologies. The Agile-Waterfall Hybrid model integrates Agile's iterative planning, gradual adaptation and robust stakeholder cooperation with the systematic, documentation-intensive, phase-by-phase approach of the Waterfall technique. This combination seeks to harness the advantages of both methodologies: Agile's adaptability and Waterfall's precision and oversight. The Traditional Waterfall model follows a rigid linear progression of phases, wherein critical decisions are finalized early, making alterations costly or unfeasible once implementation commences. This framework aims to examine whether hybrid models might provide more adaptive, resilient, and efficient project outcomes by comparing these two methods within the complex and frequently unpredictable terrain of mega-projects in Bangladesh.

The initial dependent variable, Flexibility (DV1), denotes a project's capacity to adjust to changing requirements, react swiftly to unexpected obstacles, and integrate input during the project lifetime. Considering the complexities of Bangladeshi mega-projects, such as environmental risks, fluctuating governmental objectives, land acquisition challenges, and recurrent logistical disruptions, adaptability becomes a crucial factor for project success. The concept asserts that hybrid techniques provide enhanced capacity to navigate dynamic settings by permitting iterative modifications while maintaining organized oversight. Conversely, inflexible Waterfall methodologies frequently encounter difficulties in adapting to mid-project modifications, resulting in delays, budget excesses, and diminished stakeholder contentment.

The second dependent variable, Quality (DV2), includes several parameters such as design precision, construction standards, defect reduction, and minimized rework. In Bangladesh, engineering mega-projects commonly encounter quality issues stemming from inconsistencies between design intent and on-site implementation, frequently exacerbated by late-stage design modifications or inadequate contractor coordination. The Agile-Waterfall Hybrid paradigm, with its iterative feedback loops and ongoing stakeholder engagement, can reduce these discrepancies. The hybrid approach enhances technical precision and overall building quality by facilitating regular review cycles and quicker error discovery.

The third dependent variable, Delivery Time (DV3), evaluates schedule compliance, milestone achievement, and the mitigation of unforeseen delays. Numerous conventional Waterfall-managed mega-projects in Bangladesh, including roadways, bridges, and energy infrastructure, have historically encountered substantial schedule overruns. The use of Agile components inside the hybrid paradigm facilitates mid-project adjustments, rapid decision-making, and flexible rescheduling. These capabilities enable teams to adapt more effectively to disruptions, hence enhancing the probability of adhering to project timetables.

The framework also incorporates essential moderating aspects such Organizational Culture, Managerial Competence, Stakeholder Communication Quality, and Technological Adoption (e.g., BIM). These variables influence the intensity of the correlation between the selected project management methodology and the resultant performance. A hybrid strategy may nonetheless be ineffective in businesses that oppose change or exhibit fragmented communication. These components collectively delineate the Project Performance Outcome, establishing a systematic framework for assessing whether hybrid processes yield quantifiable benefits compared to traditional methods in Bangladesh's developing mega-project environment (Table 1).

Table 1. The explanation of Dependent variables (DV's)

Dependent Variable (DV)	Description	Key Indicators
Flexibility (DV1) • Responsiveness to unexpected issues • Supports iterative decision-making • Helps manage disruptions common in Bangladeshi mega-projects (political, environmental, logistical).	Measures the project's ability to adapt and respond to dynamic conditions during execution.	• Adaptation to project changes
Quality (DV2) • Improved construction quality and compliance • Reduction of defects, errors and rework • Hybrid model's iterative feedback loops help minimize design–execution mismatches.	Assesses the overall design and construction standards achieved by the project.	• Accuracy and clarity of design outputs
Delivery Time (DV3) • Achievement of key milestones • Reduction in overall project delays • Agile components in hybrid models enable mid-project adjustments to keep schedules on track.	Evaluates the project's ability to meet planned schedules and avoid delays.	• Adherence to the project timeline

4. Limitations

When it comes to implementing Agile–Waterfall hybrid models, engineering teams in Bangladesh confront several important barriers. This is mostly since the country already has a culture of project management, infrastructure realities and organizational constraints. The inflexible hierarchical and command-driven organizational culture that is widespread in many engineering and construction organizations is one of the key obstacles. In many firms, decision-making is centralized and change is frequently opposed. Agile techniques necessitate open communication, decentralized decision-making and iterative feedback loops, all of which are conditions that are incompatible with traditional management systems that are administered from the top down. In addition, a significant number of engineering teams do not have sufficient training and a technical understanding of Agile principles. This makes it challenging to effectively incorporate iterative sprints, stand-up meetings, and fast prototyping into the larger Waterfall organization. Long clearance cycles, bureaucratic procedures, and fixed client specifications slow down the responsiveness that is required for hybrid models in Bangladesh, which is a second big obstacle. The complexity and scope of megaprojects in Bangladesh is a major challenge as well. In the field of engineering, jobs such as structural design, procurement, and construction frequently depend on tight sequencing and regulatory compliance, which restricts the flexibility that Agile seeks to offer.

Furthermore, hybrid implementation is hampered by poor stakeholder communication. This is because large projects involve a variety of stakeholders, including government agencies, consultants, international contractors, and local subcontractors. Many of these individuals adhere to various documentation standards and are not familiar with Agile collaborative methods. When iterative changes are implemented, misalignment amongst stakeholders can lead to several negative outcomes, including delays, additional work, and misunderstanding. There are also hindrances caused by technological limitations: Even though Building Information Modelling (BIM) and digital collaboration platforms can support Agile-style workflows, their adoption in Bangladesh is still unequal. This is especially true among local contractors who rely largely on manual methods. There are further limitations imposed by budgetary limits on the adoption of new technologies, training programs, and digital platforms that hybrid models typically require. Lastly, because there are no hybrid governance frameworks that have been formed in Bangladesh, teams frequently have difficulty determining which phases should adhere to the Waterfall methodology and which should adopt the Agile methodology. This results in role ambiguity, inconsistent documentation and insufficient integration between phases. Even though there is a growing demand for flexibility and efficiency in Bangladesh's fast increasing infrastructure development scene, it is challenging for engineering teams to fully realize the benefits of Agile–Waterfall hybrid models due to the combination of these challenges.

5. Conclusion

This study investigated the effectiveness of Agile–Waterfall hybrid project management techniques in improving performance results in Bangladesh's engineering mega-projects. The literature and conceptual analysis indicate that although traditional Waterfall methodologies offer robust structural control, comprehensive documentation, and regulatory compliance, they frequently fail to address the significant uncertainty, changing requirements, and environmental disruptions characteristic of large-scale projects in Bangladesh. The hybrid Agile–Waterfall model provides a balanced methodology by including iterative feedback loops, improved stakeholder involvement, and progressive flexibility inside the structured Waterfall framework. This integrated framework exhibits significant potential to enhance three critical project performance metrics: flexibility, quality, and delivery time. The study's conceptual framework emphasizes the influence of managerial ability, organizational culture, communication quality, and technical adoption (e.g., BIM) on the degree to which hybrid practices might enhance performance outcomes. Despite its potential, the research uncovers considerable practical constraints, such as opposition to cultural transformation, inadequate Agile training, government approval processes, and inadequate digital capability among project teams. These limits highlight that the effectiveness of hybrid models relies not alone on the choice of methodology but also on organizational readiness and stakeholder acceptance.

6. Future Work

Future research should focus on empirically validating the conceptual framework through field studies conducted on various engineering mega-projects in Bangladesh. Quantitative evaluations employing project success measurements, surveys and structured interviews would yield more robust evidence regarding the superiority of hybrid techniques over standard models in practical scenarios. Future study should also investigate creating a particular Agile-Waterfall governance model that works well with Bangladesh's regulatory and political environment. This involves figuring out

the best ways to divide roles, set documentation standards and make decisions for hybrid teams. Another important topic to investigate is how digital technologies like BIM, digital twin simulations and integrated project delivery platforms may help with iterative communication and cut down on design-execution mismatches. Long-term studies could further investigate the impact of cultural transformation, capacity-building initiatives and leadership training on the sustainability of hybrid adoption. Finally, analyzing the case studies from different countries may assist Bangladesh in identifying the most effective ways to enhance the scalability, flexibility, and consistency of hybrid approaches in upcoming national infrastructure projects.

References

Agile Alliance, Manifesto for Agile Software Development, Agile Manifesto, 2001.

Fowler, M., Highsmith, J., and Agile Alliance Authors, The Agile Manifesto Commentary, Agile101, 2001.

Royce, W. W., Managing the Development of Large Software Systems, Proc. IEEE WESCON, pp. 1–9, 1970.

Lalmi, A., A Conceptual Hybrid Project Management Model, ScienceDirect, 2021.

Fernandes, G., A Hybrid Project Management Model for Construction Projects, ResearchGate, 2023.

Cabalde, J. A., Integrating Agile Practices in Waterfall During Construction Phase, 2025.

Brahmbhatt, K., Agile Application in Construction Industry, ResearchGate, 2021.

Mokhtar, R., and Khayyat, M., Comparative Case Study of Waterfall and Agile Management, SAR Journal, vol. 4, no. 2, pp. 45–52, 2022.

Maidin, S., The Waterfall Model with Agile Scrum as the Hybrid Agile Model for the Software Engineering Team, 2020.

Emon, M. B., Study on Construction Delay and Factors in Bangladesh, AASMR Journal, 2019.

Sharmin, S., Rahman, M., and Karim, T., Factors Contributing to Delay and Cost Overrun in Infrastructure Projects in Bangladesh, ICMAB Report, pp. 1–15, 2024.

Rahman, M. T. U., The Padma Multipurpose Bridge: Construction Challenges, MIST Journal, pp. 22–35, 2022.

Franz, B., and Messner, J., Evaluating the Impact of BIM on Project Performance, ASCE / Pankow Foundation Whitepaper, 2017.

Wang, S. H., Lee, D., and Chang, Y., Impact of BIM Usage Levels on Project Performance, ScienceDirect, vol. 12, no. 1, pp. 55–68, 2024.

Biographies

Jubayer Ahamed completed his B.Sc. in Computer Science from American International University-Bangladesh, Dhaka, Bangladesh. He obtained his MSc from American International University-Bangladesh, Dhaka, Bangladesh. Currently, Jubayer Ahamed is working as a Lecturer in the Department of Computer Science (CS) at American International University- Bangladesh (AIUB). He is also associated with Artificial Intelligence Research & Innovation Lab (AIRIL) as a research associate. His research interests include Software Engineering and Machine Learning.

Zeba Labiba is currently doing her 2nd master's at Macquarie University, Sydney, Australia. She completed her BSc and MSc from American International University-Bangladesh, Dhaka, Bangladesh. Her research interests include Software Engineering and Machine Learning. She loves to travel, watch movies, maintain gardening etc. In the past, she worked as a quality assurance engineer (QA) in a Software Organization which was located on Dhaka, Bangladesh.

Abu Saleh Muhammod Alvy is a MSC student at American International University-Bangladesh. He has completed his BSc from American International University-Bangladesh as well. His research interests include Data Science, Software Engineering and Machine Learning.

Victor Stany Rozario is currently working as an Assistant Professor and Special Assistant in the Department of Computer Science under the Faculty of Science and Technology at AIUB. He has completed his B.Sc. in Computer Science & Engineering and M.Sc. in Computer Science from American International University-Bangladesh, Dhaka, Bangladesh. His current research interest includes Data Science, Data Mining, Intelligent Systems, Machine Learning, Web Mining and Human Computer Interaction.

Prof. Dr. Md. Asraf Ali is a man of Jessore and currently working as a Professor of Computer Science at American International University-Bangladesh (AIUB). He is actively involved in research in the fields of Biological Signal Processing, Bioinformatics, and Machine Learning. As for his research outcomes, he has published more than 50 research articles (Journal/Conference) indexed in ISI or SCOPUS. As the community service related to his research,

he is working as a Reviewer, Technical Committee member (TPC), TPC Chair, and Session Chair of many International Journals and Conferences. He is the principal investigator of Artificial Intelligence Research & Innovation Lab (AIRIL). Moreover, he is also working as an External Examiner for evaluating PhD Thesis of several universities in India.

Shamvi Md Abdullah, he is an undergraduate student at AIUB studying Computer Science and Engineering. He is currently in his 7th semester. He has mostly been focused on learning how software works, He is particularly interested in artificial intelligence as it is an exciting field, and he hopes to continue learning and gaining experience in this area.