Program Profile		
Program	Program name	Design, Development and Fabrication of a 2-seater 4-wheeled electric vehicle and establishing a racing team.
	Category	A1

Summary of Program	
Program Name	Design, Development and Fabrication of a 2-seater 4-wheeled electric vehicle and establishing a racing team.
Category	A1
Abstract of Program	This project proposes the design and fabrication of a two-seater 4-wheeled electric vehicle for the Effi-Que ADAS segment of the Efficycle competition, emphasizing intelligent mobility, safety innovation, and advanced engineering integration. Targeted at promoting the fusion of sustainability and next-gen vehicle intelligence, the prototype aligns with the competition's guidelines for smart driver-assist technologies and sustainable design ethos. The vehicle chassis is built using lightweight composite structures engineered for high torsional strength and occupant protection. A brushless DC motor powers the vehicle, supported by a regenerative braking system and energy-efficient gear train. The integration of Advanced Driver Assistance Systems (ADAS) includes proximity sensing through ultrasonic modules, blind spot detection using vision-based processing, and real-time telemetry for obstacle alerting and geofencing. The system also leverages IoT-driven diagnostics to continuously monitor motor temperature, battery state-of-charge, and vehicle positioning, thus enabling preventive maintenance and data-informed operation. All subsystems are centrally coordinated via a microcontroller architecture that allows seamless interfacing between user input and environmental sensing.

Details of Program		
Planning		
Objectives	Long-term Goals	• Establish a Sustainable Mobility Innovation Hub at World University of Bangladesh (WUB), where students can continuously design, prototype, and test electric vehicles and smart mobility solutions. • Institutionalize the Racing Team Model as a recurring academic initiative, enabling students to participate annually in competitions like Efficycle and SAE, fostering leadership and technical excellence. • Develop Commercially Viable EV Prototypes tailored for Bangladesh's urban transport needs—such as campus shuttles, last-mile delivery vehicles, and gated community transport—ready for pilot deployment and local manufacturing. • Integrate ADAS and IoT Technologies into student-built vehicles, advancing research in real-time telemetry, obstacle detection, and

		smart diagnostics to align with global trends in autonomous and connected mobility. • Publish Research Outputs in national and international journals, contributing to the academic discourse on electric mobility, ADAS systems, and interdisciplinary engineering education. • Forge Industry Partnerships with local EV startups, transport operators, and ICT firms to scale innovations, secure sponsorships, and create employment pipelines for graduates. • Embed the Program into Curricula across BSc and MSc levels, transforming it into a hands-on practicum that supports sustainability, engineering design, and entrepreneurship education.
	Short-term Targets	• Form and Launch the Student Racing Team by Q3 2025, including recruitment of 20 core members across Mechanical, Electrical, and Mechatronics disciplines. • Complete CAD Design and Simulation of the 2-seater electric vehicle using SolidWorks and IPG CarMaker, with finalized models ready for fabrication by Q4 2025. • Procure Key Components such as brushless DC motor, certified battery pack with BMS, ADAS sensors, and structural materials by end of 2025. • Begin Fabrication and Assembly in WUB's workshop, including chassis welding, suspension setup, and integration of drivetrain and electronics by early 2026. • Integrate ADAS Features like ultrasonic obstacle detection, blind spot monitoring, and IoT-based telemetry into the vehicle prototype. • Conduct Testing and Validation including brake tests, ADAS feature verification, and endurance trials on campus by mid-2026. • Participate in Effi-Que ADAS Competition with a fully functional prototype, aiming for technical inspection clearance and scoring in dynamic events. • Document and Publish Project Outcomes including DFMEA, design reports, and innovation dossiers for academic and industry review. • Establish a Green Mobility Innovation Lab to support ongoing EV and ADAS research, and embed the project into BSc/MSc curricula as a recurring practicum.
	Rationale	Bangladesh faces urgent challenges in urban mobility, environmental sustainability, and road safety. The Effi-Que ADAS EV project responds to these issues by empowering students to design and build a smart electric

		vehicle equipped with Advanced Driver Assistance Systems (ADAS). It aligns with national priorities for clean mobility and prepares students for industry through hands-on experience in engineering, fabrication, and innovation. The initiative bridges academic learning with real-world application, fostering interdisciplinary collaboration and positioning WUB as a leader in sustainable transport education.
Subject (Leader)	Initiator(s)	Rahman, MD Hasibur
	Champion(s)	Rahman, MD Hasibur
	Major team member(s)	Mujahid, Ahmad Abdullah and student co-ordinators, total 20 members.
Environment	Nature/Society	The Effi-Que ADAS EV initiative is shaped by both environmental realities and societal dynamics in Bangladesh. The country's tropical climate—with high humidity, seasonal flooding, and extreme temperatures—poses technical challenges for electric vehicle design. Components like battery packs, sensors, and wiring systems must be robust against moisture, heat, and dust to ensure reliability and safety in real-world conditions. From a societal perspective, the program navigates several constraints: • Limited Awareness of EV Technology: Many students and community members are unfamiliar with electric mobility and ADAS systems, requiring additional outreach and education to build interest and understanding. • Time Constraints for Students: Evening batch students, in particular, struggle to commit time due to academic and personal responsibilities, slowing team formation and project momentum. • Resource Accessibility: Access to fabrication tools, testing tracks, and dedicated lab space is limited, which affects the pace and quality of prototyping. • Cultural Hesitation Toward Innovation: There's a tendency among students to wait for institutional direction rather than take initiative, which can delay grassroots innovation efforts. Despite these limitations, the project is designed to be inclusive and adaptive. Faculty mentorship, interdisciplinary collaboration, and real-world relevance help bridge gaps in awareness and engagement. By simulating a full product lifecycle—from CAD modeling to testing—the program encourages students to overcome societal inertia and contribute meaningfully to sustainable mobility.
	Industry/Market	The electric vehicle and ADAS initiative at World University of Bangladesh is both inspired and constrained by the local industry landscape. While global trends in EVs and smart mobility are accelerating, Bangladesh's automotive sector remains underdeveloped, with limited infrastructure for EV manufacturing, testing, and commercialization. This restricts access to high-quality components and technical expertise.

		However, growing interest from startups and international sponsors—like SolidWorks and SimScale—provides momentum. The project aims to bridge the gap between academic innovation and market readiness by preparing students for emerging roles in EV design, embedded systems, and mobility analytics. Industry demand is rising, but institutional support and local supply chains must evolve to fully realize the program's potential.
	Citizen/Government	The Effi-Que ADAS EV initiative aligns closely with Bangladesh's national priorities for clean mobility and sustainable urban transport. Government bodies have expressed growing support for electric vehicle adoption through policy frameworks, startup incubation programs like iDEA, and incentives for green innovation. This creates a favorable environment for academic projects like WUB's electric vehicle prototype. Citizens, especially students and young professionals, are increasingly aware of environmental issues and show enthusiasm for smart mobility solutions. However, broader public engagement is still limited due to low awareness of ADAS technologies and skepticism about locally developed EVs. This presents both a challenge and an opportunity: the project can serve as a public education tool, showcasing the potential of student-led innovation. Government support may also extend to: • Pilot testing in controlled environments like campus fleets or gated communities • Grant opportunities for scaling and commercialization • Visibility through national showcases and competitions At the same time, regulatory hurdles—such as vehicle certification, roadworthiness standards, and import restrictions on components—can slow progress. Navigating these requires institutional backing and strategic partnerships with government agencies.
Resources	Human resources	The Effi-Que ADAS EV project is supported by a dedicated team of two teaching staff and twenty students from Mechanical, Electrical, and Mechatronics Engineering disciplines. This interdisciplinary mix ensures coverage across core areas such as CAD modeling, embedded systems, fabrication, and ADAS integration. While the current team is sufficient for the initial phases—design, simulation, and basic prototyping—scaling the project to full fabrication, testing, and competition readiness will require additional support. Specifically: • Faculty Mentorship: More faculty involvement across electronics, control systems, and automotive design would enhance technical depth and supervision. • Student Availability: Evening batch students face time constraints, limiting their participation. Day batch engagement is being improved through targeted outreach.

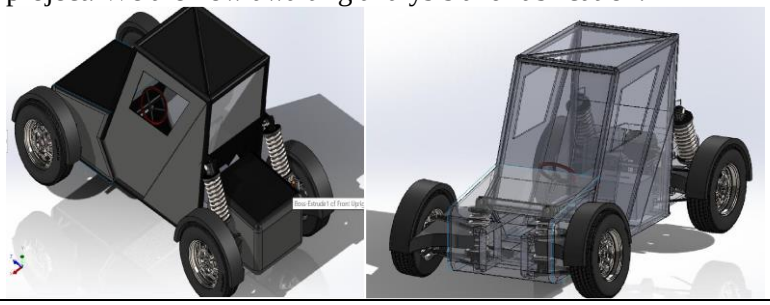
		• Specialized Roles: Roles like safety officer, documentation lead, and licensed drivers are being defined to meet competition and testing requirements. Despite these challenges, the team is motivated and growing. With continued encouragement, mentorship, and institutional support, the human resource base is expected to mature into a self-sustaining innovation ecosystem.
	Financial resources	At present, the Effi-Que ADAS EV project does not have sufficient financial resources to meet its full scope. The estimated budget of BDT 3,50,000 is required to cover essential components such as the brushless DC motor, certified battery pack with BMS, ADAS sensors, fabrication materials, and competition logistics. While some software tools are available through academic sponsorships (e.g., SolidWorks, SimScale), the hardware and fabrication costs remain a significant barrier. The university's financial support is essential to initiate and sustain the project. Without institutional funding or external sponsorships, the team cannot proceed with procurement, testing, or event participation. Budget constraints have already delayed team formation and lab setup, and the lack of dedicated fabrication tools (e.g., MIG welding, heavy-duty drilling) further restricts progress. Efforts are underway to secure sponsorships and optimize costs, but until core funding is approved, the program's execution remains limited. Institutional investment will be critical to unlock the project's full potential and ensure its success in national and international competitions.
	Technological resources	The Effi-Que ADAS EV project has access to several foundational technologies, but overall **technological support remains insufficient** for full-scale execution. On the positive side, the team benefits from academic sponsorships for simulation software like **SolidWorks** and **IPG CarMaker**, which enable advanced CAD modeling and ADAS feature simulation. These tools are critical for virtual prototyping and system validation. However, the program faces notable limitations: • **Fabrication Infrastructure**: The university lacks essential workshop equipment such as MIG welding machines, heavy-duty drilling tools, and precision cutting instruments. This restricts the ability to build and test structural components safely and efficiently. • **Testing Facilities**: There is no dedicated track or controlled environment for dynamic testing, including brake trials, endurance loops, and ADAS feature validation. • **IoT and Embedded Systems**: While the team plans to integrate microcontroller-based systems for telemetry and diagnostics, access to high-quality sensors, diagnostic dashboards, and real-time data acquisition tools is limited. • **Lab Space**: A dedicated innovation lab for EV and ADAS research is still pending, which affects documentation, team coordination, and long-term continuity. To fully realize the program's goals, significant upgrades in fabrication tools, testing environments, and embedded system resources are required. Institutional investment and industry collaboration will be key to bridging

		these gaps and transforming the initiative into a sustainable innovation platform.
Mechanism	Strategy (Weight/Sequence)	The strategic direction of the Effi-Que ADAS EV program is built on a three-tier prioritization model that reflects both academic intent and real-world relevance: 1. Subject – Highest Weight, First in Sequence The core of the program is the subject matter: electric vehicle design and ADAS integration. It drives student engagement, interdisciplinary learning, and innovation. By focusing on hands-on engineering, the program transforms theoretical knowledge into practical skills, making it the foundation of all strategic decisions. 2. Environment – Medium Weight, Second in Sequence The program is deeply influenced by Bangladesh's urban mobility challenges, environmental concerns, and policy shifts toward clean transportation. Simulating real-world automotive manufacturing and aligning with sustainability goals ensures the program remains socially and technologically relevant. 3. Resources – High Weight, Third in Sequence While resources come last in sequence, they carry high strategic weight. Adequate funding, fabrication tools, and technological infrastructure are essential for execution. Without them, the subject and environmental goals cannot be realized. Resource mobilization is therefore a critical enabler, not a starting point.
	Organization	The university's organizational structure partially aligns with the program's strategies. Faculty mentors are actively involved, and the administration has shown interest in supporting innovation through sponsorship requests and academic integration. However, gaps remain: • No dedicated lab space or fabrication workshop for EV projects • Limited cross-departmental collaboration between Mechanical, Electrical, and Mechatronics faculties • Budget approvals and procurement processes are slow, affecting project timelines To fully align, WUB must institutionalize the program as a recurring academic initiative, streamline resource allocation, and establish an innovation lab under the engineering faculty.
	Culture	The university's culture is evolving toward innovation but still faces inertia: • Students are enthusiastic but hesitant to take initiative, especially in evening batches • Faculty support is strong, but peer-to-peer mentorship and team ownership need reinforcement • Traditional academic models focused on theory limit the shift to hands-on, project-based learning Despite these challenges, the culture is shifting. The Effi-Que ADAS EV project is helping foster a mindset of experimentation, collaboration, and real-world problem solving. With continued encouragement and visibility, WUB can cultivate a culture that champions student-led innovation and sustainable engineering

Doing		
Launch date		July 2025
Responsible organization		World University of Bangladesh
Program content and process		The Effi-Que ADAS EV program at World University of Bangladesh is a student-driven initiative focused on designing and fabricating a 2-seater, 4-wheeled electric vehicle equipped with Advanced Driver Assistance Systems (ADAS). The program integrates mechanical, electrical, and software engineering disciplines to simulate a full automotive product lifecycle—from concept to competition. The content begins with team formation and orientation, where students are introduced to the Effi-Que ADAS rulebook and project scope. Participants then engage in CAD modeling using SolidWorks and simulate vehicle dynamics and ADAS features with IPG CarMaker. This phase emphasizes design accuracy, safety compliance, and innovation. Once the design is finalized, the team moves into the procurement phase, sourcing essential components such as brushless DC motors, certified battery packs with BMS, sensors, and structural materials. Fabrication follows, involving chassis welding, suspension setup, and integration of drivetrain and electronics. ADAS features like obstacle detection, blind spot monitoring, and IoT-based telemetry are embedded using microcontroller systems. Testing and validation are conducted on campus, including brake trials, endurance runs, and ADAS feature verification. The team prepares documentation such as DFMEA, design reports, and business plans for academic and industry review. The final milestone is participation in the Effi-Que ADAS competition, where the vehicle is evaluated in dynamic events.
Key highlights of the content/process		1. (Integration of ADAS Technologies The program incorporates advanced safety features such as blind spot detection, ultrasonic obstacle sensing, and IoT-based diagnostics—rare in student-built vehicles. 2. Industry-Grade Simulation Tools Students use SolidWorks and IPG CarMaker for CAD modeling and dynamic simulation, aligning academic work with professional engineering standards. 3. Interdisciplinary Curriculum Fusion The project blends mechanical, electrical, and software engineering, offering a holistic learning experience that mirrors real-world automotive development.
Differences from traditional approaches		Before the implementation of the Effi-Que ADAS EV program, students had limited exposure to interdisciplinary collaboration, real-world prototyping, or market-driven innovation. Projects were often confined to simulations or small-scale experiments without tangible outcomes or external benchmarking.

	After the program's launch, the learning model shifted dramatically: • **From Theory to Practice**: Students now engage in full-cycle vehicle development—from CAD modeling and component sourcing to fabrication, testing, and competition participation. • **From Siloed Learning to Interdisciplinary Teams**: Mechanical, electrical, and software engineering students collaborate on a unified goal, simulating real-world automotive R&D environments. • **From Passive Learning to Ownership**: Students lead the initiative, make engineering decisions, and manage documentation, fostering leadership and accountability. • **From Generic Labs to Specialized Innovation**: The program introduces ADAS technologies, IoT diagnostics, and smart mobility systems—rarely covered in traditional curricula. • **From Classroom to Competition**: Participation in Effi-Que ADAS events provides external validation, exposure, and performance benchmarking, which traditional programs lack. This transformation not only enhances technical proficiency but also prepares students for industry roles in EV design, smart mobility, and sustainable engineering—bridging the gap between academic learning and real-world impact.
Progress as of today	The following progress has been made until today's date: ● Communicating and encouraging students to start their own Racing Club. ● Collecting digital resources like Rulebook 2025 for Effi-Que ADAS segment. ● Preparation of presenting mentor's previous work and experience of Efficycle 2022 event where we've built our vehicle and participated in the event.
Problems in implementation	● Though the evening batch students are interested in the idea of creating a racing club, they don't have enough courage to start the team due to their lack of time. Working on that to encourage . ● Lack of communication with day batch students with mentor. Without having scheduled class with day batch, establishing team will take a lot of time. ● Budget constraints and sponsorship gap.
Approaches to solve the problems	Communication is increased with several batches of ME and AE. Lack of necessary equipment in fabrication lab (MIG welding, Heavy duty drilling, cutting tools) will be necessary. A dedicated room will also be required for a team
Completion date, if completed	It is scheduled to be finished by Mid 2026.
Seeing	
Impacts on students	● Empowers students with practical engineering skills in EV design, ADAS systems, and interdisciplinary teamwork. ● Enables faculty to engage in applied mentoring, innovation-based teaching, and collaborative research. ● Elevates WUB's reputation as a forward-thinking institution in sustainable mobility and smart vehicle technologies. ● Facilitates participation in national and global competitions, creating visibility and benchmarking against international standards.

	● Opens pathways for industry collaboration, recruitment, and academic enrichment aligned with market needs.
Impacts on professors	Possible responses for this Effi-Que ADAS EV project: ● **Industry** may express interest in partnerships, pilot testing, and talent recruitment for EV and smart mobility solutions. ● **Market stakeholders** could see the vehicle as viable for short-range commuting, gated community use, and last-mile logistics. ● **Government bodies** may support the initiative under clean mobility policies and startup incubation programs like iDEA. ● The project aligns with national sustainability goals and urban transport challenges, boosting its policy relevance. ● Positive reception may enhance WUB's reputation and create new opportunities for grants, showcases, and commercialization.
Impacts on university administration	Once the program's outcomes—such as student engagement, interdisciplinary collaboration, and competition participation—are formally presented to the administration, it is expected to receive strong support. The program has the potential to enhance WUB's reputation, attract industry partnerships, and position the university as a leader in clean mobility education. Efforts are underway to prepare a formal briefing and showcase the project's progress to the Vice Chancellor and senior administrators.
Responses from industry/market	Industry stakeholders in Bangladesh have shown growing interest in this kind of programs. The rising demand for affordable, locally manufacturable electric vehicles—especially for short-range commuting and last-mile logistics—makes the student-built prototype highly relevant. Companies in the EV and mobility sectors view the initiative as a potential talent pipeline and a testbed for future collaboration. Sponsorships from platforms like SolidWorks and SimScale further validate its industry appeal.
Responses from citizen/government	Government bodies are increasingly supportive of clean mobility initiatives, and the Effi-Que ADAS EV project aligns with national sustainability goals. Programs like iDEA (Innovation Design and Entrepreneurship Academy) offer potential incubation support. Citizens, particularly students and young professionals, are enthusiastic about smart mobility solutions, though broader public awareness of ADAS technology remains limited. The project serves as a bridge between academic innovation and public engagement.
Measurable output (revenues)	While the project is still in its early stages, future revenue potential includes: • Commercial deployment of campus EVs or last-mile delivery vehicles • Licensing of ADAS modules or IoT dashboards • Sponsorships and grants from industry and government bodies No direct revenue has been generated yet, but the groundwork for monetization is being laid.
Measurable input (expenses)	The estimated total input cost for the project is approximately **BDT 3,50,000**. This includes: • Component procurement: motor, battery pack with BMS, sensors, structural materials (~BDT 2,00,000–3,00,000) • Fabrication and workshop access: welding, body enclosure, electrical integration

	• Event participation: registration, logistics, team gear (~BDT 30,000–50,000) Software tools are covered via academic sponsorships, reducing licensing costs
Cost-benefit analysis for effectiveness	Key Costs ● Component Procurement: Motor, certified battery pack with BMS, ADAS sensors, dashboard, structural materials (~৳200,000–৳300,000 depending on scale) ● Fabrication & Workshop Access: Welding, body enclosure, electrical integration (in-house support reduces external expenses) ● Software Licensing & Testing Tools: IPG CarMaker, SolidWorks, material testing (~available via edu mail or institutional partnership) ● Event Participation: Registration, logistics, team gear, documentation (~৳30,000–৳50,000 per season) Expected Benefits ● Skill Development: High-impact learning in EV design, ADAS systems, teamwork, and project leadership ● Institutional Recognition: Visibility in national competitions, potential publication, and academic brand-building ● Industry Readiness: Creation of talent pipeline for automotive, energy, and mobility sectors ● Commercial Prototype: Deployable for short-range transport or logistics in urban settings with future scalability
Future Planning	
Where does the project go from here?	If the student-led team model sustains, it'll run by student's own expenses and the learning model will shift into peer-to-peer learning where seniors will guide the juniors and teach them from scratch. Also, the institute can fabricate their own vehicles(such as golf cart) with this team and to support their final year project, students can make various teams and can target different segments of vehicles such as IC engine vehicles etc.
Addendum	
Exhibits, pictures, diagrams, etc.	The following chassis and body model have been designed as part of this project. We are now awaiting analysis and fabrication. 

	  Previous work of Effi-Quo 2022 competition.
Reports, mimeos, monographs, books, etc.	Reports will be generated as the project of building EV goes on. Initially, CAD and Project plan will be created. From Begining, finance and sponsorship report will be shared with HoD and mentor. Other documents will be there as soon as the works start.
Others which may help explain the program (including website links)	Each documentation will be kept in team room and HoD and mentor will have access to every documents (such as DFMEA, CAD report, project plan , BOM, CAD, Kinematic case study etc.)