Faculty of Science and Engineering

School of Computing

COMP 8770 - INFORMATION SYSTEMS PROJECT AND RISK MANAGEMENT

IS PROJECT MANAGEMENT BUSINESS PLAN

Assignment 2

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1. Executive Summary

This report aims to critically compare three delivery strategies for the development of an Autonomous Cars (AC) programme: an initial ChatGPT-generated plan, a Google Gemini's plan, and a Group-Refined Hybrid plan created by the consulting team. The initial AI-only drafts demonstrate sound foundational directions, but underestimate real-world complexities, and fail to present comprehensive contingency & risk management. In contrast, the Hybrid plan integrates the strongest elements of both AI drafts with human domain expertise, yielding a more realistic roadmap.

Anchored by a Cost Breakdown Structure (CBS) mapped to a detailed Work Breakdown Structure (WBS), the Hybrid plan allocates roughly $1bn with a 12 percent contingency over 17 months. A BPMN-driven process model embeds iterative R&D loops and ISO-26262-compliant traceability, with an ISO-31000-aligned risk register that assigns funded treatments & weekly monitoring.

Strategically, the recommended plan positions the organisation to capture first-mover advantages in AC development without sacrificing regulatory confidence or fiscal discipline. By combining AI-powered analytics for scheduling, forecasting, and documentation, with human oversight for ethics, stakeholder management, and critical decision-making, the Hybrid plan balances innovation with pragmatism, offering a realistic path to a certified AC development programme.

2. Context

2.1. The Project Background

The automotive sector is experiencing a foundational shift, which is driven by technology advancements in artificial intelligence, sensor technology, and connectivity. The development of autonomous cars (AC) brings notable value to various aspects, such as transforming transportation, making roads safer, improving efficiency, and generating new economic opportunities. This initiative will strategically put our organization at the center of this transformation.

This initiative acknowledges that autonomous car deployment is not merely an engineering problem. It involves a strong and cohesive framework of information systems necessary for coping with the highly complex data streams, development cycles, regulatory requirements, and day-to-day operations. This effort will center on creating the required information systems, project organization structures, and risk reduction strategies necessary for the possible development and market entry of an autonomous car.

2.2. The Role of AI in the Overall Project Framework

Artificial intelligence (AI) has been identified as a key enabling technology for autonomous driving. In this project, AI will be implemented as the core for enhancing perception, decision-making, and control. As a result, the project plan will necessarily encompass the information systems necessary to:

1. **AI development management:** Consists of data handling for training AI algorithms, versioning of algorithms, as well as computational and testing infrastructure.

2. **Implement integration of AI and vehicle systems:** Including the information architecture required for seamless communication between the vehicle's hardware components (sensors, actuators, etc.) and the AI software.

3. **Achieving AI reliability and safety:** involves adequate testing and verification processes as well as monitoring and data analysis to determine and rectify any potential issues.

4. **Manage the data produced by AI:** The autonomous car will produce lots of data. The initiative must make provision for the processing, analysis, and storage of it for ongoing improvement, diagnostics, and possible novel services.

3. Business Case

3.1. AI Plan 1 (ChatGPT)

The project tasks for the WBS and Gantt chart of the Autonomous Car Development Plan were drafted with ChatGPT. There are six major phases, broken down into actionable tasks with specified durations, start and end dates, dependencies, and assigned roles. By feeding some key information on high-level project objectives and asking basic prompts, ChatGPT was able to transform into a systematic organization of project stages, from Initiation through to Deployment & Review. The initial plan generated by ChatGPT offers a solid foundational framework; however, it requires further refinement due to its oversimplified task structure and the inclusion of resource allocations that may not accurately reflect real-world constraints.

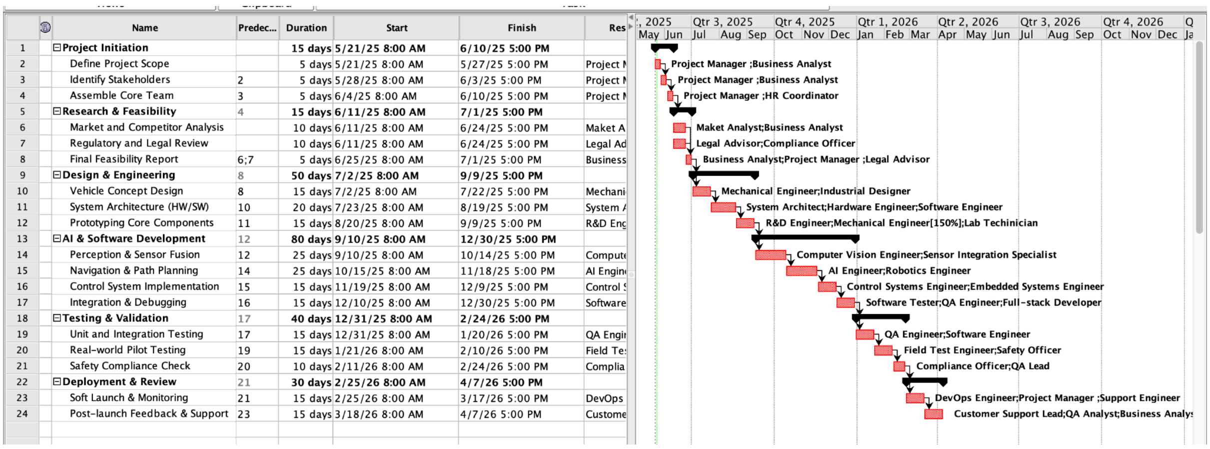


Figure 1: ChatGPT AI Plan - Gantt Chart & WBS (**Appendix 1 & 2**)

3.2. AI Plan 2 (Google Gemini)

The project tasks for the WBS and Gantt chart of the AI Plan for the autonomous car project were generated using Google Gemini, an advanced AI-powered tool designed to assist with project planning and task breakdown. By leveraging Gemini's capabilities, we were able to define a clear project structure that identifies key phases, activities, dependencies, durations, and resource allocations with precision. Gemini helped translate high-level project goals into actionable tasks and timelines, ensuring logical sequencing and alignment with project objectives. This approach not only streamlined the planning process but also ensured consistency and clarity across the WBS and Gantt chart, making it easier to visualize and manage the project from initiation to completion.

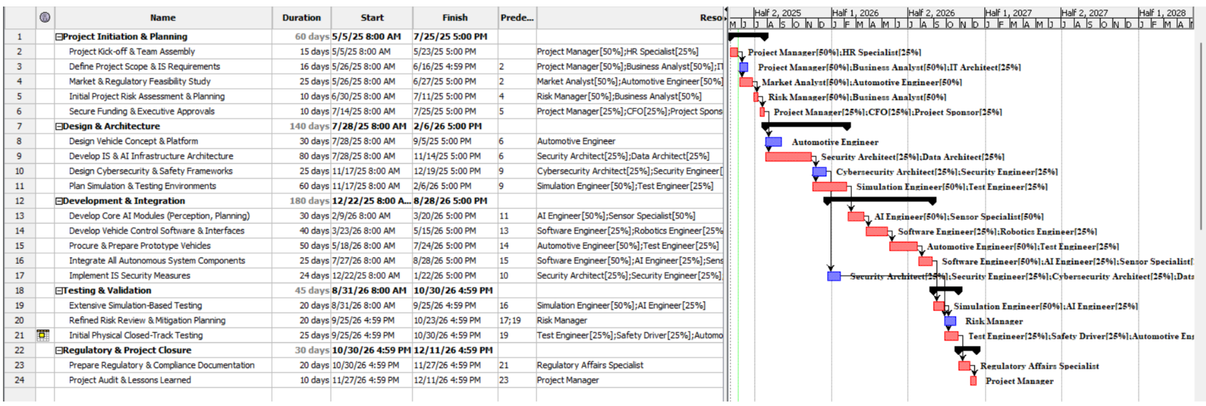


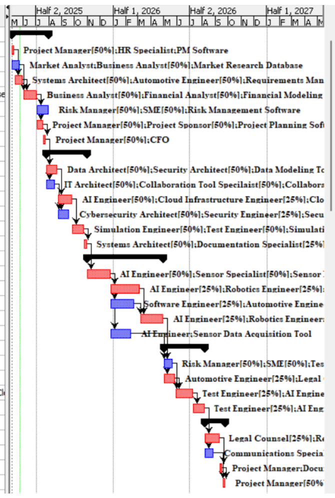
Figure 2: Google Gemini AI Plan - Gantt Chart & WBS (**Appendix 3 & 4**)

3.3. Final Plan

The Work Breakdown Structure (WBS) and Gantt chart for the autonomous car project present a structured and phased approach to system development and delivery. The WBS is broken into five main phases: **Planning**, **Design & Architecture**, **Development & Integration**, **Testing & Validation**, and **Regulatory & Pre-Launch**. Each phase includes clearly defined tasks with specific durations, dependencies, and assigned resources, offering a comprehensive view of the project's scope and effort.

The Gantt chart visually maps out the timeline from **May 5, 2025**, to **September 24, 2026** (~**17.5 months**), showing overlapping tasks, critical dependencies, and resource allocation. It provides a real sense of progression, from early planning activities like team formation and competitive analysis, through to AI development, integration, and final compliance approvals. The chart also highlights concurrent workstreams, such as system architecture and testing preparations, emphasizing the project's complexity and coordination needs.

	Name	Duration	Start	Finish	Prede...	Resource Names
1	**Planning**	64 days	**5/5/25 8:00 AM**	**7/31/25 5:00 PM**		
2	Project Initiation & Team Formation	5 days	5/5/25 8:00 AM	5/9/25 5:00 PM		Project Manager[50%];HR Specialist;PM Software
3	In-depth Market Research & Competitive Analysis	15 days	5/5/25 8:00 AM	5/23/25 5:00 PM		Market Analyst;Business Analyst[50%];Market Research Database
4	Define High-Level System Requirements	15 days	5/12/25 8:00 AM	5/30/25 5:00 PM	2	Systems Architect[50%];Automotive Engineer[50%];Requirements Management Tool
5	Detailed Business Case Development	24 days	6/2/25 8:00 AM	7/3/25 5:00 PM	3;4	Business Analyst[50%];Financial Analyst[50%];Financial Modeling Software;Legal Counse
6	Initial Risk Assessment & Management Planning	20 days	7/4/25 8:00 AM	7/31/25 5:00 PM	5	Risk Manager[50%];SME[50%];Risk Management Software
7	Define High-Level Project Plan & Governance Structur	10 days	7/4/25 8:00 AM	7/17/25 5:00 PM	5	Project Manager[50%];Project Sponsor[50%];Project Planning Software
8	Secure Project Funding & Approvals	5 days	7/18/25 8:00 AM	7/24/25 5:00 PM	7	Project Manager[50%];CFO
9	**Design & Architecture**	70 days	**7/25/25 8:00 AM**	**10/30/25 5:00 PM**		
10	Define Data Management Strategy & Architecture	20 days	7/25/25 8:00 AM	8/21/25 5:00 PM	8	Data Architect[50%];Security Architect[50%];Data Modeling Tool;Cloud Storage Tool
11	Set Up & Configure Project Collaboration Tools & Prot	15 days	7/25/25 8:00 AM	8/14/25 5:00 PM	8	IT Architect[50%];Collaboration Tool Specilaist[50%];Collaboration Software
12	Design AI Development Infrastructure	25 days	8/22/25 8:00 AM	9/25/25 5:00 PM	10	AI Engineer[50%];Cloud Infrastructure Engineer[25%];Cloud Computing Platform
13	Design Cybersecurity Framework & Implementation Pl	20 days	8/22/25 8:00 AM	9/18/25 5:00 PM	10;11	Cybersecurity Architect[50%];Security Engineer[25%];Security Assessment Tool
14	Design Simulation & Testing Environment	20 days	9/26/25 8:00 AM	10/23/25 5:00 PM	12	Simulation Engineer[50%];Test Engineer[50%];Simulation Software
15	Finalize System Architecture & Design Documentation	5 days	10/24/25 8:00 AM	10/30/25 5:00 PM	14	Systems Architect[50%];Documentation Specialist[25%];Documentation Tool
16	**Development & Integration**	130 days	**10/31/25 8:00 A...**	**4/30/26 5:00 PM**		
17	Develop Core Perception Algorithms	40 days	10/31/25 8:00 AM	12/25/25 5:00 PM	15	AI Engineer[50%];Sensor Specialist[50%];Sensor Data Acquisition Tool;Annotation Tool
18	Develop Decision-Making & Path Planning Algorithms	50 days	12/26/25 8:00 AM	3/5/26 5:00 PM	17	AI Engineer[25%];Robotics Engineer[25%];Simulation Environment
19	Develop Vehicle Control System Interface	40 days	12/26/25 8:00 AM	2/19/26 5:00 PM	17	Software Engineer[25%];Automotive Engineer[25%]
20	Integrate Perception, Decision & Control Systems	40 days	3/6/26 8:00 AM	4/30/26 5:00 PM	18;19	AI Engineer[25%];Robotics Engineer;Software Engineer[25%];Simulation Environment
21	Develop Sensor Fusion Algorithms	35 days	12/26/25 8:00 AM	2/12/26 5:00 PM	17	AI Engineer;Sensor Data Acquisition Tool
22	**Testing & Validation**	70 days	**5/1/26 8:00 AM**	**8/6/26 5:00 PM**		
23	Comprehensive Risk Assessment & Refinement	15 days	5/1/26 8:00 AM	5/21/26 5:00 PM	20;21	Risk Manager[50%];SME[50%];Test Engineer[50%];Risk Management Software
24	Develop Detailed Safety Protocols & Procedures	20 days	5/1/26 8:00 AM	5/28/26 5:00 PM	20	Automotive Engineer[25%];Legal Counsel[50%]
25	Extensive Simulation Testing & Validation	30 days	5/29/26 8:00 AM	7/9/26 5:00 PM	23;24	Test Engineer[25%];AI Engineer[25%];Simulation Engineer[25%];Simulation Software;Cl
26	Initial Closed-Track Testing & Validation	20 days	7/10/26 8:00 AM	8/6/26 5:00 PM	25	Test Engineer[25%];AI Engineer[25%];Safety Driver[25%]
27	**Regulatory & Pre-Launch**	35 days	**8/7/26 8:00 AM**	**9/24/26 5:00 PM**		
28	Prepare Regulatory Documentation & Submissions	25 days	8/7/26 8:00 AM	9/10/26 5:00 PM	26	Legal Counsel[25%];Regulatory Affairs Specialist[50%]
29	Plan Public Communication & Stakeholder Engagement	15 days	8/7/26 8:00 AM	8/27/26 5:00 PM	26	Communications Specialist[50%];PR Manager[25%]
30	Final Project Review & Lessons Learned	5 days	9/11/26 8:00 AM	9/17/26 5:00 PM	28	Project Manager;Documentation Tool
31	Secure Final Approvals & Prepare for Next Steps	5 days	9/18/26 8:00 AM	9/24/26 5:00 PM	29;30	Project Manager[50%];Project Sponsor[50%]



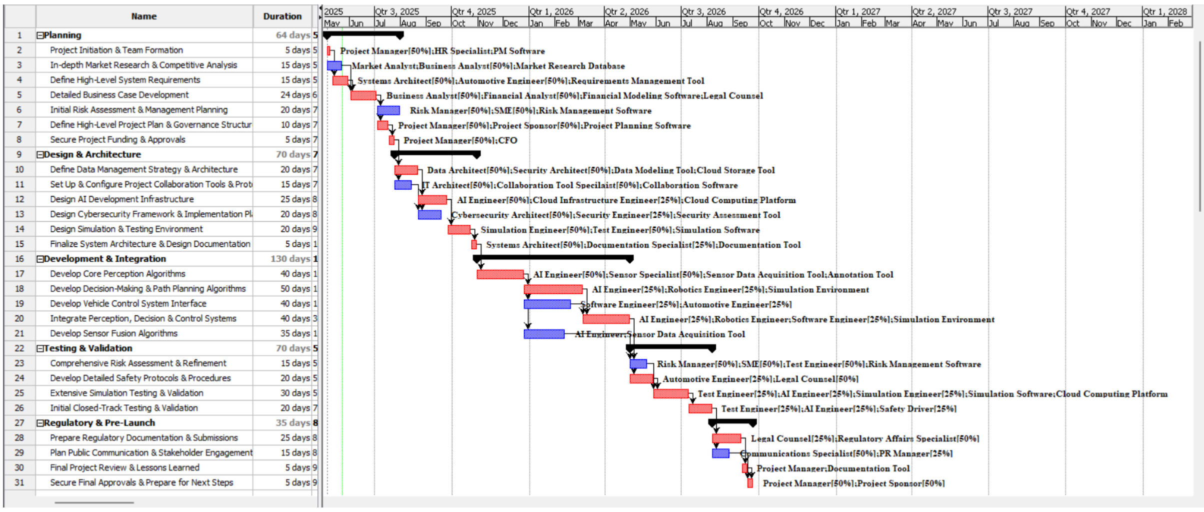


Figure 3: Final Project - Gantt Chart & WBS (**Appendix 5 & 6**)

3.4. Cost Allocation and Strategic Justification by Areas

The overall budget for the project has been estimated at AUD **1 billion,** utilizing a mix of **Cost Breakdown Structure** (**CBS**) and **standardized cost modeling**. Financial resources were mapped against the Work Packages of the project, utilizing a Cost Breakdown Structure in coordination with the Work Breakdown Structure (WBS). It facilitates systematic recognition and classification of direct and indirect cost drivers and promotes budget clarity, cost control, and coordination with the delivery of the project (ProjectManager.com, 2023). CBS also facilitates financial feasibility by monitoring what specific areas of the project cost the most and pose the greatest risks. The cost allocation framework is also used based on best practices in AI-specific cost management research and literature. As Bassis (2024) notes, AI projects not only require traditional R&D investments but also ongoing operations spending on high-end computing and large-scale data processing, as well as ongoing model retraining—areas often downplayed in traditional IT project budgeting. The detailed allocation of this project is outlined in the table below:

Field	Total Allocation	Explaination
Research and Development (R&D)	AUD 300M - 400M	Autonomous car development is heavily R&D intensive. Includes AI & ML, sensor integration, non-AI software, simulation & testing. This includes: **AI & Machine Learning:** Core to autonomy; requires top talent and high-performance infrastructure. **Sensor Integration:** Critical for accurate perception and decision-making. **Non-AI Software Development:** Ensures seamless operation of vehicle systems. **Simulation & Testing:** Enables safe, large-scale validation before real-world deployment.
Information Systems Infrastructure	AUD 150M - 200M	A robust IS infrastructure is critical for managing the vast amounts of data, facilitating collaboration, ensuring security, and supporting the development process. This includes: **Data Storage & Management:** To handle large-scale sensor and training datasets. **Collaboration Tools:** Platforms for team coordination, sharing, and version control. **Cybersecurity:** Safeguards critical data and systems.
Engineering and Prototyping	AUD 200M - 250M	Building and testing physical prototypes is an essential part of the development process. This includes: **Vehicle Platform Acquisition:** For system integration and testing. **Hardware Integration:** Combining sensors and compute units. **Prototyping:** Iterative builds to detect and solve hardware issues early.
Regulatory and Legal	AUD 50M - 100M	Navigating the complex and evolving regulatory landscape for autonomous cars requires legal expertise and resources for compliance. This includes: **Legal Counsel:** Covers IP, liability, and regulatory strategy. **Certification & Testing:** Required for market approval.
Project Management and Administration	AUD 50M - 100M	Effective project management is crucial for coordinating the complex activities and ensuring the project stays on track and within budget. This includes: **PM Team:** Oversee timelines, risks, and execution. **Communication & Reporting:** Ensures stakeholder alignment and transparency.

Figure 4: Cost Allocation (**Appendix 7**)

3.5. Financial and Strategic Justification by Project Phases

Project Phase	Estimated Budget Share (%)	Estimated Budget Amount (AUD)	Alignment with Budget Categories
Phase 1: Planning & Definition	5%	$50 Million	Primarily Project Management & Administration, some initial R&D for market analysis and feasibility.
Phase 2: Design & Architecture	20%	$200 Million	Significant Information Systems Infrastructure (design), early R&D for system architecture, some Project Management.
Phase 3: Development & Integration	40%	$400 Million	Heaviest R&D investment (AI, sensor fusion), significant Engineering & Prototyping for initial integration, ongoing IS infrastructure development.
Phase 4: Testing & Validation	25%	$250 Million	Primarily Engineering & Prototyping (prototype testing, test facilities), significant R&D for advanced simulation, ongoing Project Management.
Phase 5: Regulatory & Pre-Launch	10%	$100 Million	Predominantly Regulatory & Legal costs, Public Communication, final Project Management and preparation for potential next steps.
Total	**100%**	**$1 Billion**	

Figure 5: Justifications by Project Phases

3.6. Project Success Criteria

Project success in autonomous car development extends beyond traditional criteria such as time, cost, and scope. Project success has also been conceptualized as multi-dimensional, as suggested by Shenhar et al. (2001), involving both short-term implementation and long-range strategic results. Accordingly, the success of this AC project will be assessed through the dimensions shown in the table below:

Success Criteria	Justification
Scalable and Secure Information Systems Backbone	Successful deployment of an IS architecture capable of managing high-volume data, computation, and security demands. Rationale: Critical enabler for AC development and operations.
Functional Autonomous Driving Platform (Alpha/Beta Stage)	Development of core AC capabilities—perception, decision-making, control—demonstrated in controlled environments with a clear path to further refinement. Rationale: Shows tangible progress beyond theoretical models.
Regulatory Milestone Achievement	Engagement with regulators and progress toward compliance with key safety and legal standards. Rationale: Essential for future deployment and market access.
High-Performing Multidisciplinary Team	Effective recruitment and integration of experts across AI, engineering, legal, and project management domains. Rationale: Project complexity requires coordinated, cross-functional expertise.
Comprehensive Risk Management Framework	Active implementation of a dynamic framework for identifying, mitigating, and monitoring project risks. Rationale: Vital for managing uncertainty and ensuring resilience.

Figure 6: Project Success Criteria (**Appendix 8**)

3.7. Indicators of Project Success for Management

For a visionary autonomous car initiative, satisfying the manager is a key measure of success. Management wants assurance that strategic ambitions are being achieved, resources are used efficiently, and stakeholders' expectations are met. As Davis (2014) observes, success will typically be measured differently by each faction, and each will be more important in their own eyes—tangible progress and long-term value to managerial interests. Rajablu et al. (2015) also emphasize aligning outcomes with leadership priorities. This project thus defines success in terms of metrics directly aligned to managerial interests—technological delivery, compliance, scalability, and capability development, guaranteeing confidence in delivery and readiness for the future.

- **Technological Advancement:** Tangible progress in AI, sensor fusion, and control systems, with the creation of unique IP or competitive technological advantages.
  Logic: Sustainable innovation is the true metric of success.

- **Strategic Partnerships:** Formation of impactful collaborations with tech providers, research institutions, and regulators to strengthen capabilities and market access.
  Logic: External alliances are vital in this complex ecosystem.

- **Scalable Development Infrastructure:** Implementation of adaptable systems (data pipelines, testing tools, simulation environments) that support future growth.
  Logic: Robust infrastructure is the foundation for ongoing innovation.

- **Safety-First Development Culture:** Evidence of rigorous testing protocols and embedded safety practices.
  Logic: Trust and regulatory approval depend on demonstrable safety.

- **Pathway to Commercialization:** Clear trajectory toward future products, services, or IP monetization, even if immediate revenue is not the goal.
  Logic: Long-term financial viability is essential.

- **Organizational Learning and Capability Building:** Growth in internal expertise and knowledge base across AC-related domains.
  Logic: Capability building ensures sustained innovation capacity.

3.8. Ensuring Realisation of Expected Benefits by Management

Management should implement a systematic and proactive approach in benefit tracing and alignment to achieve the anticipated benefits of the AC venture. It consists of defining explicit success criteria, keeping agile oversight at all times, and involving stakeholders at every phase of the venture to promote value as well as responsibility. Key Performance Indicators (KPIs) outlining how success will be monitored and measured are detailed below:

- **Clear Benefit Mapping:** Define strategic, technological, and learning benefits at the outset and link them to specific deliverables.
  Logic: You can't achieve what isn't clearly defined.
- **KPI Establishment:** Use targeted KPIs to track progress, such as:
  - Tech Advancement: AI model accuracy, successful test scenarios
  - Partnerships: Number/quality of strategic alliances
  - Infrastructure: Data capacity and usage metrics
  - Safety: Incident rates, protocol compliance
  - Commercial Pathway: Market research progress, early partner interest
  - Learning: Staff training and internal knowledge transfer
- **Ongoing Monitoring:** Regularly track and report KPI performance to enable early corrective actions.
  Logic: Real-time data enables agile management.
- **Stakeholder Engagement:** Maintain active dialogue with internal teams, partners, and regulators to ensure benefit alignment and address issues early.
  Logic: Engagement drives ownership and collaboration.
- **Flexible Management:** Adapt plans based on monitoring data and stakeholder feedback.
  Logic: Agility is critical in a fast-evolving domain.
- **Dedicated Benefit Reviews:** Conduct regular assessments focused on benefit realization, involving key stakeholders and resulting in clear action items.
  Logic: Keeping benefits top-of-mind sustains long-term value.

4. Process Model

The process of creating an autonomous car requires a well-planned yet adaptable execution strategy. Our team suggests a **BPMN-style process model** specifically designed for autonomy projects, considering the complexity of AI model training, embedded system integration, real-world safety validation, and changing regulatory frameworks.

This approach aligns perfectly with the Work Breakdown Structure (WBS) presented in Section C and balances the **precision of COMP8770 project governance practices** with the **modular adaptability** needed to address risks, incorporate continuous feedback, and ensure compliance with safety-critical standards.

4.1. Additional Studies

Additional studies and proofs of concept (PoCs) are critical to lower the risks in technological and operational aspects. These studies will start from the start of the project, and will cover different aspects mentioned below.

- **Technology Solution Proofs of Concept (PoCs):** Detailed PoCs before committing to a specific AI architecture. For instance:
    - <u>Novel Sensor Fusion Algorithms:</u> A PoC to validate the accuracy and latency of merging data from different sensors (e.g., LiDAR, camera, radar) under various environmental conditions.
    - <u>Edge Case Scenario Handling:</u> Some rare situations are hard to simulate. These PoCs will test how the AI handles tricky or unexpected "edge" cases safely.
    - <u>Low-Level Control System Responsiveness:</u> Checks on how quickly and accurately the car's control system responds to AI commands are done. That includes things like braking, steering, and acceleration.
- **User/Stakeholder Prototype Elicitation and Feedback:** Early, basic prototypes will be shared with potential users, regulatory bodies, and internal stakeholders. Their iterative feedback will help refine what the system needs to do and how it should behave during the development process.
- **Regulatory Sandboxing and Pilot Programs:** Since AV regulations are still evolving, it is necessary to work with regulators early through sandbox programs and small

pilot tests. This gives an initial chance to check the safety approaches and make sure that the project is aligned with legal expectations. It will help to minimize surprises during the final Regulatory & Deployment phase.

- **Early & Continuous Cybersecurity Vulnerability Assessments:** Independent vulnerability assessments and penetration testing will be done continuously to identify and fix security flaws to ensure that they do not get embedded deeply in the system.

4.2. Recommended Process Model and Rationale

For a project of this complex scope, a **BPMN-aligned process model** offers an optimal mix of clarity, control, and adaptability. Hence, parallel running deep R&D, regulatory dependencies, and safety-critical deployment, as well as other essential tasks, is essential. The BPMN approach emphasizes **clearly defined phases**, **embedded subprocesses**, and **feedback loops localized within those subprocesses**, and helps to ensure a quick and proactive delivery of the project.

4.2.1 Overview of BPMN Phases (Aligned with WBS and Business Case)

Phase	Description	Key Outputs
A. Project Initiation	Define objectives, stakeholders, and feasibility. Set strategic intent.	Business goals, stakeholder matrix, feasibility report
B. Planning	Finalize scope, schedule, budget, and resource allocations. Develop initial risk register.	WBS, Gantt chart, budget forecast, governance model
C. Design & Architecture	Architect hardware, AI, and IS components. Define data flows and cybersecurity models.	System blueprints, AI architecture, IS plans
D. Development & Integration	Build AI models and vehicle software; integrate subsystems.	Trained models, integrated system
E. Testing & Validation	Simulate, test, and evaluate system at module, integration, and field levels.	Test reports, safety validation, risk metrics
F. Regulatory Compliance	Prepare and submit safety documentation. Engage in sandbox testing.	Certification packages, audit responses
G. Pilot Deployment	Conduct limited real-world rollout, collect operational feedback.	Deployment report, live telemetry, incident tracking
H. Post-Deployment Ops	Monitor performance, issue updates, manage feedback and incidents.	Ongoing updates, performance metrics

Figure 7: Recommended BPMN Phases

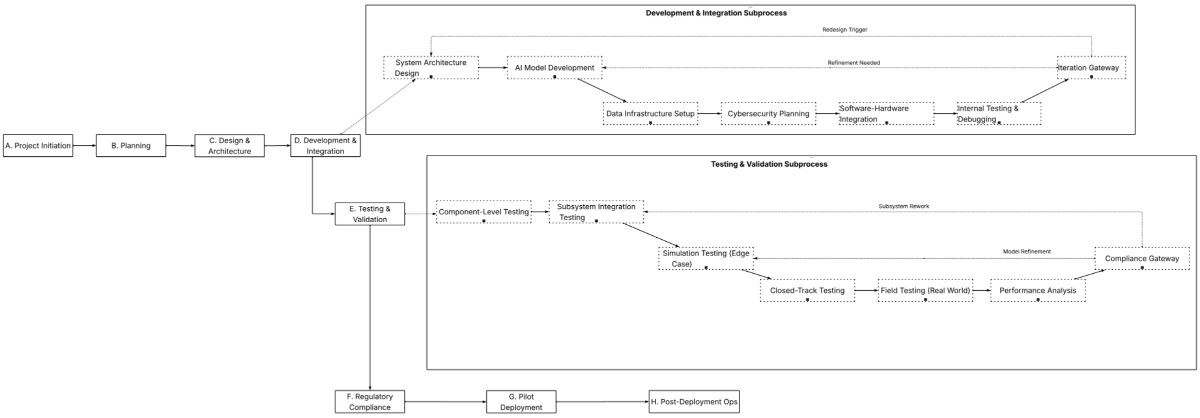


Figure 8: BPMN for the development of an Autonomous Car program (**Appendix 9**)

4.2.2 Key Subprocess Flows

<u>a. Design & Development Subprocess</u>

Step	Description	Feedback Loops
1. System Architecture Design	Finalize the overall hardware-software blueprint, including sensor layout, onboard compute, and communication networks.	May require changes after integration bottlenecks are identified.
2. AI Model Development	Train core models for perception, decision-making, and control using curated, annotated datasets.	Feedback from test failures and edge case anomalies may require retraining or architectural changes.
3. Data Infrastructure Setup	Establish pipelines for sensor data ingestion, annotation tools, model versioning, and cloud integration.	Adjustments may be needed to support large-scale simulation/testing data.
4. Cybersecurity Planning	Define threat models and embed security controls in architecture, especially for data exchange and control pathways.	Updated as new vulnerabilities are discovered in pen testing.
5. Software-Hardware Integration	Integrate AI software with embedded systems and vehicle actuators. Includes debugging timing, protocol mismatches, etc.	Issues in system latency or actuator feedback may trigger software/hardware rework.
6. Internal Testing & Debugging	Execute dry runs on integrated systems in test environments; fix defects before full testing rollout.	Faults identified here loop back to AI, integration, or even architectural redesign.
7. Iteration Decision Gateway	Analyze readiness for testing phase. If KPIs not met or blocking issues persist, return to previous steps.	May return to AI model dev, integration, or architecture design.

Figure 9: Detailed view of Design & Development Subprocess

b. Testing & Validation Subprocess

Step	Description	Feedback Loops
1. Component Testing	Isolate and test each module (e.g., camera feed, LiDAR driver, AI inference engine) for performance and correctness.	Defects here feed back to corresponding development teams.
2. Subsystem Integration Testing	Validate perception–planning–control chain, sensor synchronization, and data fusion accuracy.	Inconsistencies may require adjustments in integration or timing parameters.
3. Simulation Testing (Edge Cases)	Use simulation environments to test rare, risky, or failure-prone driving scenarios at scale.	Poor performance here triggers AI retraining or perception pipeline tuning.
4. Closed-Track Testing	Conduct real-world testing in safe, controlled physical tracks simulating traffic, weather, and road conditions.	Fails in safety behavior or reaction time loop back to AI model refinement.
5. Field Testing (Real World)	Live AV operation under limited public conditions. Collect telemetry, detect incidents or anomalies.	Critical incidents may pause deployment and trigger rollback to development.
6. Performance Analysis	Analyze all test metrics (latency, safety margin, decision time) against defined success thresholds.	Any missed KPIs require additional tuning and validation.
7. Compliance Review Gateway	Final check for regulatory, safety, and documentation readiness.	New regulatory feedback or failures may trigger partial redesign or documentation updates.

Figure 10: Detailed view of Testing & Validation Subprocess

4.2.3 Rationale for BPMN-Based Process Model

The selected BPMN approach has other benefits as well- it supports traceability, which is a must in safety-critical and highly regulated projects. Traceability ensures that the documentation stays aligned with compliance standards such as ISO26262. The other rationale is outlined in the table below.

Criteria	BPMN Strength & Relevance
Regulatory Accountability	Each activity is traceable and auditable, supporting compliance with ISO 26262, UNECE WP.29, and safety standards.
Risk-Managed Execution	Subprocess checkpoints and decision gateways embed structured risk monitoring and treatment across all phases.
Continuous Feedback and Quality Improvement	BPMN allows feedback loops within subprocesses (e.g., AI training or simulation) to support iterative refinement without disrupting the full lifecycle.
Clarity Across Multidisciplinary Teams	BPMN diagrams provide a universal visual language, aiding communication across AI, engineering, and legal teams.
Alignment with Business Phasing	BPMN phases directly mirror the project's WBS and budget structure, enabling milestone-driven investment and reporting.

Figure 11: Proposed BPMN Strength & Relevance

5. Risk Management Plan

This section outlines a robust Risk Management Plan, focusing exclusively on **project-specific risks** pertinent to this Autonomous Car development initiative, as opposed to generic risks that affect most projects. The aim is to proactively identify, analyze, assess, treat, and monitor these risks to minimize their potential impact on project objectives, budget, and timeline.

The risk assessment process integrates the following key strategies:

5.1. Risk Identification, Analysis, and Assessment

This phase takes the risk assessment framework from Aven and Zio (2015) and puts it to work on the project's risk metrics. It starts by identifying risks that are specific to the project, then looks at what those risks are like and how likely they are to occur. The goal is to understand their potential impact early on. Here, the spotlight is on risks tied to developing autonomous cars and the supporting information systems, relevant in Sections B (Context) and C (Business Case)..

Risk Rating Scale:

- **Probability** (**Likelihood of Occurrence**):
    - **1** (**Rare**): <10% chance of occurring.
    - **2** (**Unlikely**): 10-30% chance of occurring.
    - **3** (**Moderate**): 30-60% chance of occurring.
    - **4** (**Likely**): 60-90% chance of occurring.
    - **5** (**Almost Certain**): >90% chance of occurring / Very High
- **Impact** (**Severity of Consequence**):
    - **1** (**Insignificant - I**): Minor inconvenience, no measurable impact on budget/schedule/quality.
    - **2** (**Minor - MN**): Small disruption, minor cost/schedule deviation (<5%), easily managed.

○ **3 (Moderate - MD):** Noticeable disruption, moderate cost/schedule deviation (5-10%), some rework, minor safety concern.

○ **4 (Major - MJ):** Significant disruption, major cost/schedule deviation (>10%), significant rework, moderate safety concern, reputational damage.

○ **5 (Catastrophic - C):** Project failure, critical safety failure, severe legal action, massive financial loss, severe reputational damage.

		CONSEQUENCE				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
LIKELIHOOD	Almost Certain 5	low	medium	high	extreme	extreme
	Likely 4	low	medium	high	extreme	extreme
	Possible 3	low	medium	high	high	extreme
	Unlikely 2	low	medium	medium	high	extreme
	Rare 1	low	low	medium	medium	high

Figure 12: Risk Matrix - Strategic Development Milestones (Author's work, 2025)

Overall Risk Rating Categories:

- **Critical:** Score > 18. Immediate, urgent action required. The project is at severe risk.
- **Extreme:** Score 13-18. High priority action required. Very serious implications.
- **High:** Score 9-12. Significant action required. Serious implications.
- **Medium:** Score 5-8. Action required, managed within typical project processes.
- **Low:** Score 3-4. Monitor, minimal action.
- **Very Low:** Score 1-2. Accept, no action required.

Unacceptable Risks for Treatment: For this safety-critical project, risks rated **High, Extreme, and Critical** are considered unacceptable and require dedicated treatment plans.

ID	Risk Description	Category	Probability (P)	Impact (I)	P x I Score	Initial Risk Rating
R1	**AI Model Failure in Novel Scenarios:** Autonomous AI model performs unpredictably or fails in previously unencountered, complex real-world driving situations, leading to accidents.	Technology / Safety	4 (Likely)	5 (Catastrophic)	20	Critical
R2	**Cybersecurity Breach of Vehicle/IS:** Malicious attack on vehicle software or cloud-based IT infrastructure, compromising safety systems, user data, or intellectual property.	Cybersecurity / Safety	4 (Likely)	5 (Catastrophic)	20	Critical
R3	**Regulatory Approval Delays/Denial:** Project experiences significant delays or outright denial of operational permits due to evolving, strict, or inconsistent autonomous vehicle regulations.	Regulatory / Legal	4 (Likely)	4 (Major)	16	Extreme
R4	**Sensor System Malfunction/Degradation:** Lidar, radar, camera, or ultrasonic sensors fail or degrade unexpectedly due to environmental factors (e.g., heavy rain, fog) or hardware defects, impairing perception.	Hardware / Safety	3 (Moderate)	4 (Major)	12	High
R5	**Data Management Scalability Failure:** Inability of data pipelines and storage to handle the massive volume of sensor data for training and validation, leading to bottlenecks and development delays.	Data / Infrastructure	3 (Moderate)	3 (Moderate)	9	High
R6	**Scarcity of Specialized AI/Robotics Talent:** Difficulty in recruiting and retaining highly skilled AI, robotics, and safety engineers, leading to project delays and quality issues.	Human Resources	4 (Likely)	3 (Moderate)	12	High
R7	**High-Fidelity Simulation Environment Inadequacy:** Simulation tools used for testing do not accurately replicate real-world conditions or edge cases, leading to undetected AI flaws.	Testing / Technology	3 (Moderate)	4 (Major)	12	High
R8	**Supply Chain Disruptions for Critical Components:** Unavailability or significant delays of specialized hardware components (e.g., high-performance computing units, specific sensors) due to global supply issues.	Supply Chain	3 (Moderate)	3 (Moderate)	9	High
R9	**Public Acceptance/Trust Issues:** Widespread public distrust or negative perception of autonomous vehicles due to highly publicized incidents or ethical concerns, impacting market adoption or regulatory support.	External / Reputation	2 (Unlikely)	4 (Major)	8	Medium
R10	**Integration Complexities of Subsystems:** Challenges in seamlessly integrating diverse hardware and software subsystems from multiple vendors, leading to unexpected conflicts or performance issues.	Integration / Technical	3 (Moderate)	3 (Moderate)	9	High

Figure 13: Project-Specific Risk Identification and Initial Assessment (**Appendix 10**)

5.2. Risk Treatment Plan and Mitigation

This part uses the ISO 31000:2009 risk management framework to shape how the project handles serious risks—specifically those rated "High," "Extreme," or "Critical." The main goal here is to bring those risks down to a manageable level, either by lowering how likely they are to happen, how bad the impact could be, or both.

For each risk that's considered unacceptable, a tailored plan will be put in place. The treatment strategies will include a few different approaches:

- **Avoidance:** Changing the project plan to eliminate the risk, like adjusting the project scope, for example.
- **Reduction or Mitigation:** Taking steps to reduce how often the risk might happen or how severe it could be. This will likely be the go-to approach, since the nature of the project involves a fair amount of built-in risk.
- **Transfer:** Passing the risk on to someone else, such as through insurance or outsourcing parts of the work.
- **Acceptance:** Sometimes, the risk is acknowledged without any action being taken. This only happens if the risk is very minor or if dealing with it doesn't make financial

sense. Still, that's not something you'd expect often with the higher-risk items we're talking about here.

For each risk discovered, the project team uses a customized treatment strategy with a well-defined corresponding set of SMART actions—actions being Specific, Measurable, Achievable, Relevant, and Time-bound. In line with the stepwise framework recommended by Bjerke and Renger (2017), we prioritize establishing clarity over the specific and measurable first before deciding on the achievable and timelines, both relying significantly on baseline and contextual limitations. We also make each SMART action cost-justified to ensure mitigation activities are both effective and economically sound. Once the treatment plan is in place, the team will look at how effective it's been by checking the residual risk rating.

ID	Risk	Treatment Plan / Mitigation Actions	Cost Justification	Current (P x I)	Residual Risk (P x I)	Residual Risk Rating
			High Risks			
R4	**Sensor System Malfunction/Degradation**	Implement redundant sensor systems, environmental testing, regular calibration, advanced sensor fusion.	Cost offset by reduced risk of catastrophic failure/legal damages.	12	3	Low
R5	**Data Management Scalability Failure**	Cloud-native data lake, distributed processing frameworks (Spark/Hadoop), automated archiving.	Investment less than potential cost of delays or bottlenecks.	9	2	Very Low
R6	**Scarcity of Specialized AI/Robotics Talent**	University partnerships, aggressive recruitment, strong culture, internal training/upskilling.	Recruitment costs less than potential project delays/failure.	12	4	Low
R7	**High-Fidelity Simulation Environment Inadequacy**	Advanced simulation platforms, continuous real-world data updates, fuzz/adversarial testing.	Simulation cost lower than physical testing or recall costs.	12	4	Low
R8	**Supply Chain Disruptions for Critical Components**	Multiple qualified suppliers, buffer stocks, long-term agreements, regional sourcing.	Cost of inventory less than impact of supply chain disruption.	9	3	Low
R10	**Integration Complexities of Subsystems**	Modular architecture, clear APIs, CI/CD pipelines, version control and configuration management.	Architectural investment reduces rework and costly integration delays.	9	4	Low
			Extreme Risks			
R3	**Regulatory Approval Delays/Denial**	Dedicated regulatory team, proactive regulatory engagement, robust documentation strategy.	Proactive engagement/documentation minimizes delays and market exclusion.	16	6	Medium
			Critical Risks			
R1	**AI Model Failure in Novel Scenarios**	Diverse redundant AI architectures, extensive training datasets, formal verification, safety framework.	Costs minimal compared to potential liability and reputational damage.	20	8	Medium
R2	**Cybersecurity Breach of Vehicle/IS**	Multi-layered security architecture, penetration testing, cybersecurity standards compliance.	Investment significantly less than damage from cybersecurity breaches.	20	8	Medium

Figure 14: Risk Treatment Plans (**Appendix 11**)

5.3. Risk Monitoring and Controls

Risk monitoring is an ongoing process. Controls are also set up to add new risk factors that are identified during the project. Both help to ensure that the identified risks are tracked, monitored regularly, and new risks are identified promptly. These are done using the following methods:

- **Risk Register:** Maintain a weekly risk register to track identified risks, their current status, assigned owners, and mitigation actions.

- **Regular Reviews:** The risks are discussed in weekly team meetings and monthly committee meetings, and tallied with the key project's milestones and evaluated. (**e.g., Task 23: Comprehensive Risk Assessment & Refinement during Testing & Validation phase**).
- **Key Performance Indicators** (**KPIs**)**:** KPIs like the accuracy of the AI models, incident rates during testing, and progress on regulatory submissions will be monitored regularly.
- **Control Effectiveness Evaluation:** Periodically assessing the effectiveness of implemented controls and keeping the KPIs on track will be the aim.
- **Environmental Scanning:** Continuous monitoring of the external environment (technological advancements, regulatory changes, competitive landscape, cybersecurity threats) to identify emerging risks.

5.4. Resourcing and Budgets for Risk Management

Effective risk management requires dedicated resources and budgetary allocation.

- **Human Resources:** A Risk Manager (50% allocation during Planning and Testing- Tasks 6 & 23) will lead all risk-related efforts. Besides, the subject matter experts in different fields of AI, engineering, legal, and cybersecurity will be consulted, who will support risk analysis and treatment planning as needed.
- **Software Tools:** Specialized tools (mentioned in WBS- Tasks 6 & 23) will be used to manage the risk register, run analyses, and generate reports.
- **Contingency Budget:** Around 10–15% of the AUD 1 billion budget is set aside for unexpected or residual risks, as part of sound financial planning for high-uncertainty R&D projects like this.
- **Training:** Some budget is allocated for training teams on risk assessment methods and safety standards.

5.5. Responding to Risks

A clear response protocol is essential for risks that materialize and take time to solve. They are as follows:

- **Escalation Matrix:** Different risk levels have different escalation paths. Minor issues will be handled by the team leads. Major or high-impact issues will be escalated to the Project Manager and the Steering Committee.
- **Contingency Plans:** For high-risk items, there will be contingency plans ready to go. These will be a part of the treatment strategy and can be activated if the risk materialises.
- **Lessons Learned:** When a risk does materialize, a "lessons learned" session will be held. Discussion will be conducted on what went wrong, what mitigation measures were tried, and what should change moving forward.
- **Communication Plan:** A strong communication plan makes sure the right people are informed quickly and clearly. Timely updates on what has happened and what's being done about it will be communicated to concerned individuals.

5.6. Context-Specific Risks and Cost-Effectiveness

This autonomous car project comes with a set of risks that are built into what it is AI-driven, which is majorly safety-critical, and is operating in a tightly regulated space. These include (as detailed in Table 1):

- AI Model Failure in Novel Scenarios: The AI system might struggle in unfamiliar situations, which could lead to serious issues on the road.
- Cybersecurity Breach of Vehicle/IS: With so much software and connectivity involved, there's a real risk of attacks on either the vehicle or its backend systems.
- Regulatory Approval Delays/Denial: Getting approval is tough in the autonomous driving space due to the strict and still-developing rules. Delays here could slow everything down.
- Sensor System Malfunction/Degradation: The vehicle relies on its sensors to understand the world, thus, it is necessary to keep those intact on all vehicles.
- Data Management Scalability Failure: There is a large data processing involved, requiring fast and efficient systems at all times.

- Scarcity of Specialized AI/Robotics Talent: Top-notch people who are highly specialized in their domain need to be used, as this is a very critical project. Less efficient talent hampers deliverability and quality.

5.7. Possibility of Risk Mitigation

As shown in Table 2, each of these context-specific risks can be significantly reduced with the right strategies in place. The main points mentioned, such as building in multiple layers of redundancy, following security-by-design principles, and having good talent, are the key. These steps help lower the chances and the impacts of risks. In a complex field like autonomous driving, there is always going to be some level of residual risk. The key, however, is making sure it stays within manageable levels.

5.8. Cost-Effectiveness of Treatment Strategies

The treatment strategies in place are considered highly cost-effective, even if some require a decent upfront investment. The reasoning comes down to a simple cost-benefit analysis, which is spent now to avoid far bigger losses later. For example:

- AI model failure: Spending 10-15% of R&D budget on better data, simulation, and safety checks might be considered high, but it is only a fraction of the multi-billion-dollar liability, reputational ruin, and project cancellation costs.

- Cybersecurity breach: 5-7% of the cost of proactive cybersecurity measures is significantly less than the potential financial losses from data theft, intellectual property compromise, system paralysis, and fines following a major breach.

- Regulatory delays: Investing in legal experts and early regulatory engagement is far cheaper than not being able to legally access the market, or facing long delays that could make the entire R&D effort irrelevant.

- Talent scarcity: Hiring and keeping top talent isn't cheap. But the alternative would be missed deadlines, poor-quality work, or even as big as total project failure, due to missing expertise would cost much more in the long run.

6. Evaluation & Conclusion

6.1. Comparative Evaluation:

Overall, throughout this report, we have presented two AI-generated plans and one final comprehensive plan for the development of an Autonomous Car's information system, underpinned by strong project management practices and holistic risk management strategies. Based on the principles rooted in information system project management and risk assessment, the following criteria are leveraged to critically evaluate the three options for this safety-critical IS project:

Criteria	**Why it matters for a safety-critical IS project**
Cost realism	R&D-intensive programmes like Autonomous Car development impose significant costs unpredictability due to high day-to-day operating expenses (OPEX) and a strong need for buffers (Fuchs, Nowicke and Strube, 2017).
Schedule credibility	Since market windows & regulatory pilots tend to be fixed dates, floating time on the project's critical path needs to be carefully calibrated to ensure meeting these deadlines (World Economic Forum, 2025).
Process maturity	Process maturity of the project directly correlates to the defect rates of the development cycles, especially since external regulators could request an audit on both final products & development processes.
Risk posture	The comprehensiveness of the list of funded mitigations and residual risks showcases the risk inclination of the project.
Regulatory readiness	Due to recent Uber's AV crash (Smiley, 2023), regulatory safety cases & road-compliance tests have tended to be pushed up earlier in the process (Reiley, Bullard and McMiller, 2023).
Resource	High-quality AI personnel and functional-safety hires are scarce,

alignment	with phased recruitment lowering ramp-up risks

Table 1: Critical Evaluation for the 3 plans

Based on these criteria, the following comparative evaluation of the three plans is composed:

	Chat GPT plan	**Google Gemini plan**	**Group-refined Hybrid**
Cost realism	Single lump-sum estimate ($1bn) with no Cost Breakdown Structure or contingency	Cost buckets are named but fail to include indirect costs nor reserve	Budget is tightly mapped CBS-WBS, and carries a 10-15% contingency reserve
Schedule credibility	12-month Gantt Chart, with no slack or risk-based buffers	14-month Gantt chart, with no buffer tasks	Dated Gantt Chart (May 2025 - Sept 2026) with explicit slack on the critical path
Process maturity	Agile sprints without project life cycles or safety gating	Waterfall-style WBS with no iterative loops or traceability	Hybrid V-model with iterative BPMN loops and gated reviews
Risk posture	List of generic IT risks, without funded treatments	Identifies more risks but fails to provide analysis or treatments	40+ project-specific risks scored in ISO-31000 matrix & funded mitigations
Regulatory readiness	Safety sign-off is deferred to the final milestone	Added compliance gates but failed to designate accountability	Built-in process flow and WBS with regulatory sandbox and pilot programs
Resource	Assume the current	Proposes bulk hiring	Phased recruitment to

alignment	staff could absorb all the work	in the last quarter, creating significant ramp-up risks	match skill demand and de-risk talent acquisition

Table 2: Comparative Analysis of all 3 plans

The AI-generated drafts demonstrate a high level of speed and creativity. However, the lack of depth is needed for a safety-critical, large-budget Autonomous Car initiative. ChatGPT's plan underestimates efforts and fails to account for governance, while Gemini's version glosses over contingency & regulatory nuances.

6.2. Recommendations

Our Hybrid option showcases both AIs' strongest ideas and embeds them in a rigorous project-management and risk-management framework. In essence, it outperforms in most, if not all, success-critical dimensions. Despite costing more and requiring more time, those figures are evidence of realism, reflecting:

- A balance of ambition & feasibility: full-lifecycle of R&D under BPMN-aligned process model, while keeping the 17-month timeline within a reasonable market window.
- Reserved slack for complexities: to absorb certification bottlenecks, commonly 3-6 months for other AC programmes.
- Risk preparedness: a funded risk register whose expected monetary value (EMV) is lower than either AI plans' because high-severity risks are properly treated.

6.3. Future Directions:

Conversely, AI is capable of delivering solid early wins for project management in AC programmes. Early adopters are already running GenAI on the majority of their projects and reaping higher productivity & decision accuracy (Tredger, 2024). It is also excellent at cutting cost overruns & trimming schedule slip-ups on complex programmes (Aurigo Lumina, 2025).

As presented above, AIs are already capable of generating decent first drafts, reducing the startup times for PMOs handling sizable ventures, i.e., Autonomous Car development. In the near five-year future, digital-twin PMOs have the potential to recalculate costs & schedule impacts in real-time (McKinsey, 2025).

The Hybrid approach, as we presented, would be the go-to methodology for successfully leveraging AIs in the product management practice. Indeed, AIs are specifically useful at large-scale data crunching (i.e., scheduling/cost forecasts), templated paperwork (i.e., regulation-compliance drafts, stakeholder summaries), and continuous monitoring (i.e., risk scoring, EMV roll-ups) (PMI, 2023). For safety-critical decisions, humans are still the core factor to drive ethical judgment, regulate changes, and decide on strategic trade-offs.

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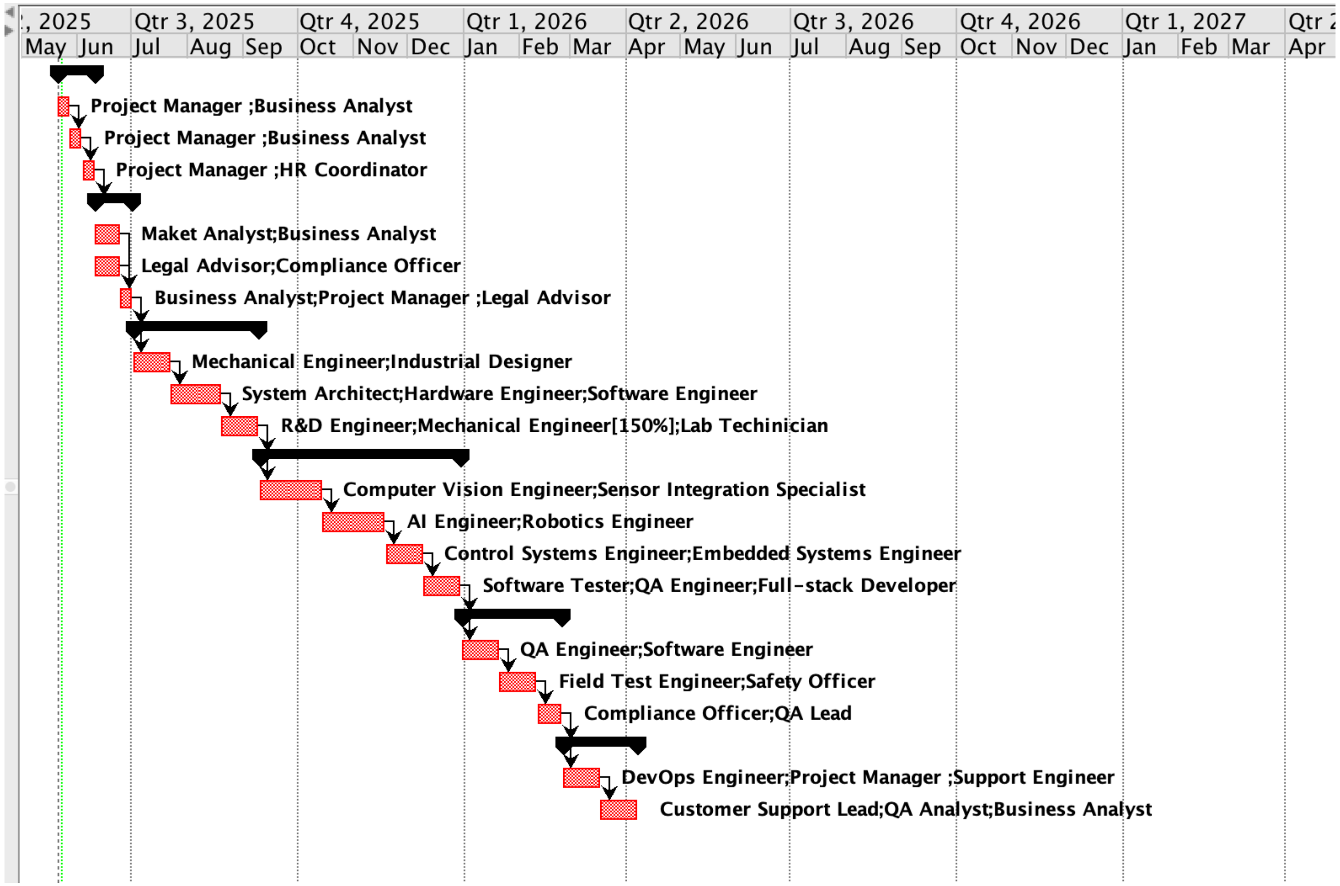
8. Appendix

Name	Predec...	Duration	Start	Finish	Resource Names
Project Initiation		15 days	**5/21/25 8:00 AM**	**6/10/25 5:00 PM**	
Define Project Scope		5 days	5/21/25 8:00 AM	5/27/25 5:00 PM	Project Manager ;Business Analyst
Identify Stakeholders	2	5 days	5/28/25 8:00 AM	6/3/25 5:00 PM	Project Manager ;Business Analyst
Assemble Core Team	3	5 days	6/4/25 8:00 AM	6/10/25 5:00 PM	Project Manager ;HR Coordinator
Research & Feasibility	**4**	15 days	**6/11/25 8:00 AM**	**7/1/25 5:00 PM**	
Market and Competitor Analysis		10 days	6/11/25 8:00 AM	6/24/25 5:00 PM	Maket Analyst;Business Analyst
Regulatory and Legal Review		10 days	6/11/25 8:00 AM	6/24/25 5:00 PM	Legal Advisor;Compliance Officer
Final Feasibility Report	6;7	5 days	6/25/25 8:00 AM	7/1/25 5:00 PM	Business Analyst;Project Manager ;Legal Advisor
Design & Engineering	**8**	50 days	**7/2/25 8:00 AM**	**9/9/25 5:00 PM**	
Vehicle Concept Design	8	15 days	7/2/25 8:00 AM	7/22/25 5:00 PM	Mechanical Engineer;Industrial Designer
System Architecture (HW/SW)	10	20 days	7/23/25 8:00 AM	8/19/25 5:00 PM	System Architect;Hardware Engineer;Software Engineer
Prototyping Core Components	11	15 days	8/20/25 8:00 AM	9/9/25 5:00 PM	R&D Engineer;Mechanical Engineer[150%];Lab Techinician
AI & Software Development	**12**	80 days	**9/10/25 8:00 AM**	**12/30/25 5:00 PM**	
Perception & Sensor Fusion	12	25 days	9/10/25 8:00 AM	10/14/25 5:00 PM	Computer Vision Engineer;Sensor Integration Specialist
Navigation & Path Planning	14	25 days	10/15/25 8:00 AM	11/18/25 5:00 PM	AI Engineer;Robotics Engineer
Control System Implementation	15	15 days	11/19/25 8:00 AM	12/9/25 5:00 PM	Control Systems Engineer;Embedded Systems Engineer
Integration & Debugging	16	15 days	12/10/25 8:00 AM	12/30/25 5:00 PM	Software Tester;QA Engineer;Full-stack Developer
Testing & Validation	**17**	40 days	**12/31/25 8:00 AM**	**2/24/26 5:00 PM**	
Unit and Integration Testing	17	15 days	12/31/25 8:00 AM	1/20/26 5:00 PM	QA Engineer;Software Engineer
Real-world Pilot Testing	19	15 days	1/21/26 8:00 AM	2/10/26 5:00 PM	Field Test Engineer;Safety Officer
Safety Compliance Check	20	10 days	2/11/26 8:00 AM	2/24/26 5:00 PM	Compliance Officer;QA Lead
Deployment & Review	**21**	30 days	**2/25/26 8:00 AM**	**4/7/26 5:00 PM**	
Soft Launch & Monitoring	21	15 days	2/25/26 8:00 AM	3/17/26 5:00 PM	DevOps Engineer;Project Manager ;Support Engineer
Post-launch Feedback & Support	23	15 days	3/18/26 8:00 AM	4/7/26 5:00 PM	Customer Support Lead;QA Analyst;Business Analyst

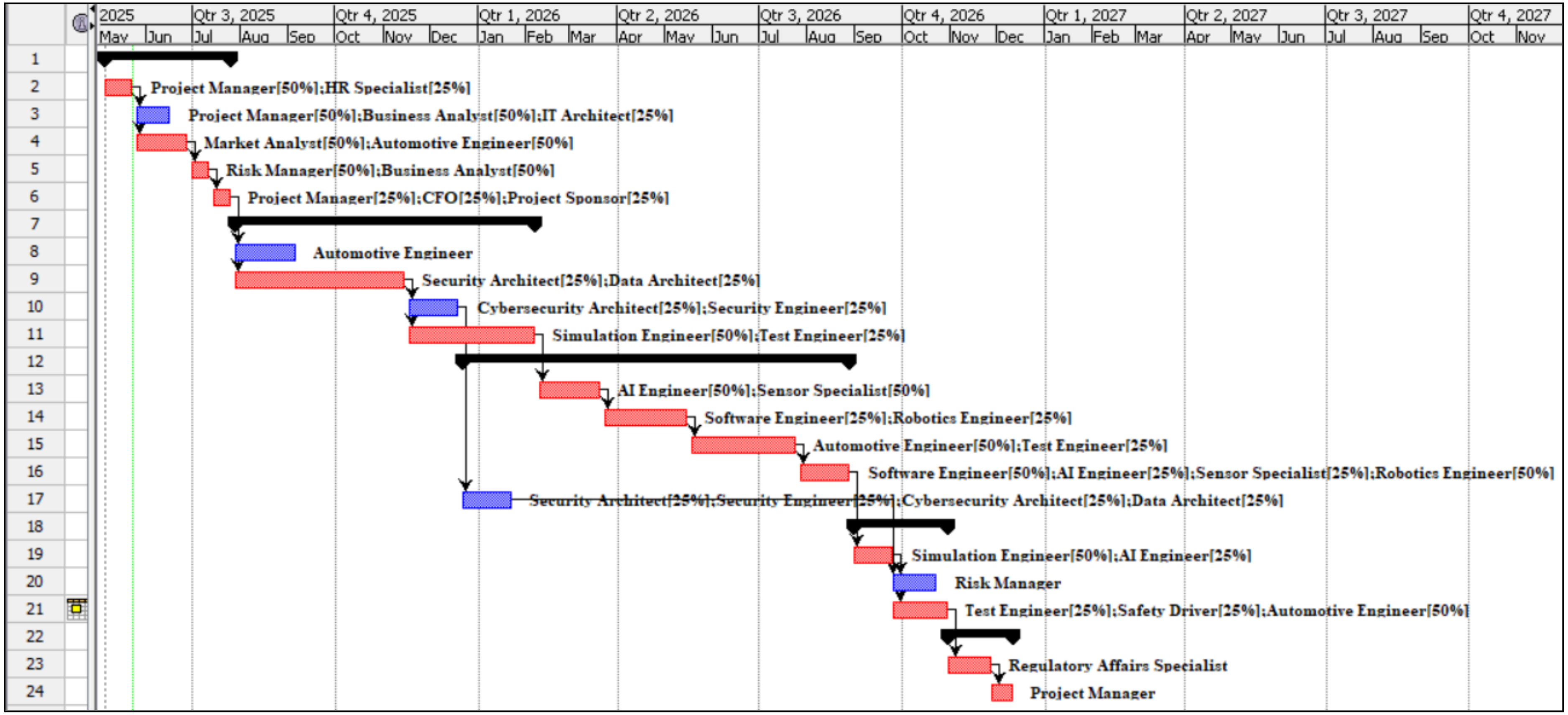
Appendix 1: ChatGPT Plan - WBS



Appendix 2: ChatGPT Plan - Gantt Chart

	Name	Duration	Start	Finish	Predece...	Resource Names
	⊟Project Initiation & Planning	**60 days**	**5/5/25 8:00 AM**	**7/25/25 5:00 PM**		
	Project Kick-off & Team Assembly	15 days	5/5/25 8:00 AM	5/23/25 5:00 PM		Project Manager[50%];HR Specialist[25%]
	Define Project Scope & IS Requirements	16 days	5/26/25 8:00 AM	6/16/25 4:59 PM	2	Project Manager[50%];Business Analyst[50%];IT Architect[25%]
	Market & Regulatory Feasibility Study	25 days	5/26/25 8:00 AM	6/27/25 5:00 PM	2	Market Analyst[50%];Automotive Engineer[50%]
	Initial Project Risk Assessment & Planning	10 days	6/30/25 8:00 AM	7/11/25 5:00 PM	4	Risk Manager[50%];Business Analyst[50%]
	Secure Funding & Executive Approvals	10 days	7/14/25 8:00 AM	7/25/25 5:00 PM	5	Project Manager[25%];CFO[25%];Project Sponsor[25%]
	⊟Design & Architecture	**140 days**	**7/28/25 8:00 AM**	**2/6/26 5:00 PM**		
	Design Vehicle Concept & Platform	30 days	7/28/25 8:00 AM	9/5/25 5:00 PM	6	Automotive Engineer
	Develop IS & AI Infrastructure Architecture	80 days	7/28/25 8:00 AM	11/14/25 5:00 PM	6	Security Architect[25%];Data Architect[25%]
	Design Cybersecurity & Safety Frameworks	25 days	11/17/25 8:00 AM	12/19/25 5:00 PM	9	Cybersecurity Architect[25%];Security Engineer[25%]
	Plan Simulation & Testing Environments	60 days	11/17/25 8:00 AM	2/6/26 5:00 PM	9	Simulation Engineer[50%];Test Engineer[25%]
	⊟Development & Integration	**180 days**	**12/22/25 8:00 AM**	**8/28/26 5:00 PM**		
	Develop Core AI Modules (Perception, Planning)	30 days	2/9/26 8:00 AM	3/20/26 5:00 PM	11	AI Engineer[50%];Sensor Specialist[50%]
	Develop Vehicle Control Software & Interfaces	40 days	3/23/26 8:00 AM	5/15/26 5:00 PM	13	Software Engineer[25%];Robotics Engineer[25%]
	Procure & Prepare Prototype Vehicles	50 days	5/18/26 8:00 AM	7/24/26 5:00 PM	14	Automotive Engineer[50%];Test Engineer[25%]
	Integrate All Autonomous System Components	25 days	7/27/26 8:00 AM	8/28/26 5:00 PM	15	Software Engineer[50%];AI Engineer[25%];Sensor Specialist[25%];Robotics Engineer[50%]
	Implement IS Security Measures	24 days	12/22/25 8:00 AM	1/22/26 5:00 PM	10	Security Architect[25%];Security Engineer[25%];Cybersecurity Architect[25%];Data Architect[25%]
	⊟Testing & Validation	**45 days**	**8/31/26 8:00 AM**	**10/30/26 4:59 PM**		
	Extensive Simulation-Based Testing	20 days	8/31/26 8:00 AM	9/25/26 4:59 PM	16	Simulation Engineer[50%];AI Engineer[25%]
	Refined Risk Review & Mitigation Planning	20 days	9/25/26 4:59 PM	10/23/26 4:59 PM	17;19	Risk Manager
	Initial Physical Closed-Track Testing	25 days	9/25/26 4:59 PM	10/30/26 4:59 PM	19	Test Engineer[25%];Safety Driver[25%];Automotive Engineer[50%]
	⊟Regulatory & Project Closure	**30 days**	**10/30/26 4:59 PM**	**12/11/26 4:59 PM**		
	Prepare Regulatory & Compliance Documentation	20 days	10/30/26 4:59 PM	11/27/26 4:59 PM	21	Regulatory Affairs Specialist
	Project Audit & Lessons Learned	10 days	11/27/26 4:59 PM	12/11/26 4:59 PM	23	Project Manager

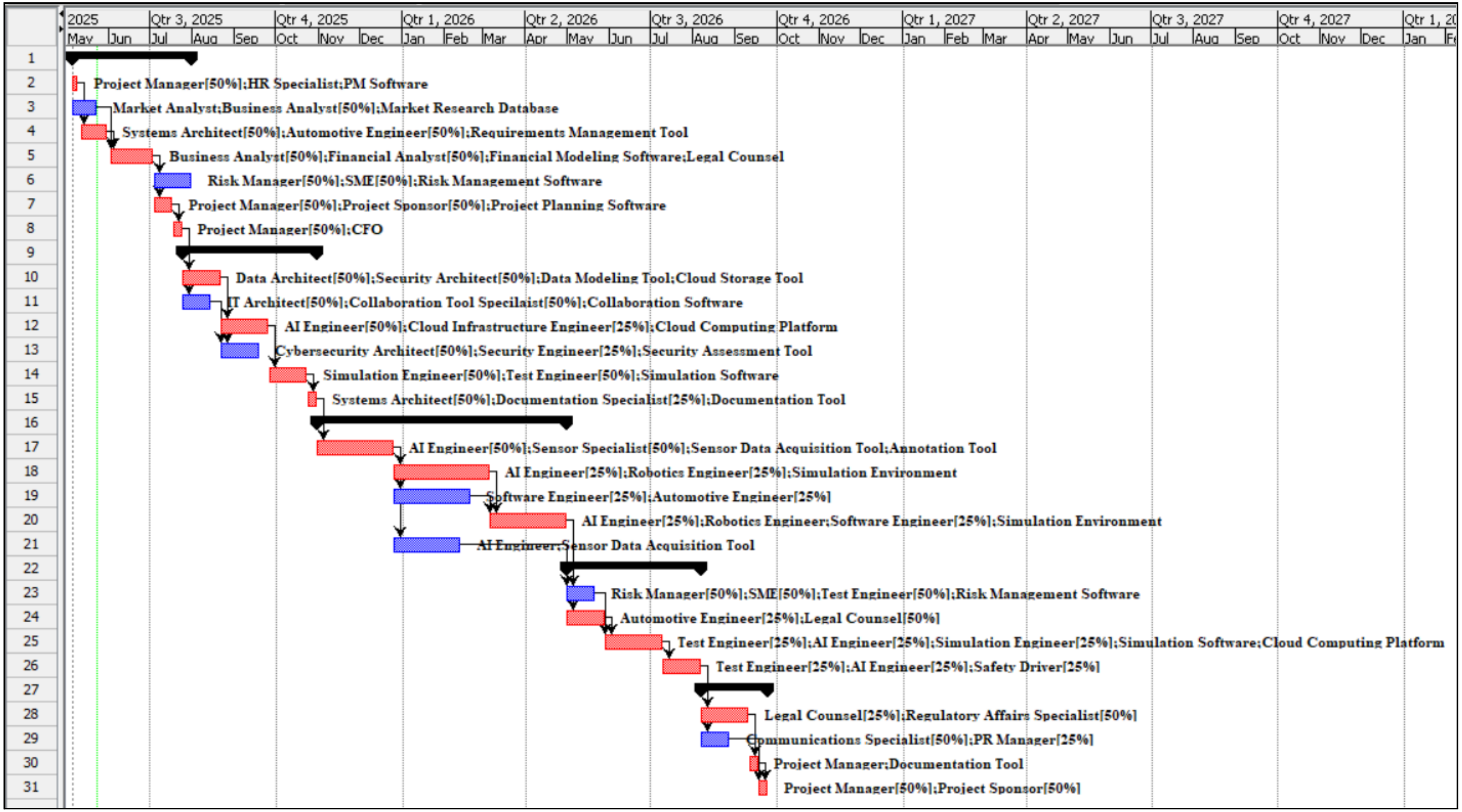
Appendix 3: Google Gemini Plan - WBS



Appendix 4: Google Gemini Plan - Gantt Chart

		Name	Duration	Start	Finish	Predece...	Resource Names
1		**Planning**	**64 days**	**5/5/25 8:00 AM**	**7/31/25 5:00 PM**		
2		Project Initiation & Team Formation	5 days	5/5/25 8:00 AM	5/9/25 5:00 PM		Project Manager[50%];HR Specialist;PM Software
3		In-depth Market Research & Competitive Analysis	15 days	5/5/25 8:00 AM	5/23/25 5:00 PM		Market Analyst;Business Analyst[50%];Market Research Database
4		Define High-Level System Requirements	15 days	5/12/25 8:00 AM	5/30/25 5:00 PM	2	Systems Architect[50%];Automotive Engineer[50%];Requirements Management Tool
5		Detailed Business Case Development	24 days	6/2/25 8:00 AM	7/3/25 5:00 PM	3;4	Business Analyst[50%];Financial Analyst[50%];Financial Modeling Software;Legal Counsel
6		Initial Risk Assessment & Management Planning	20 days	7/4/25 8:00 AM	7/31/25 5:00 PM	5	Risk Manager[50%];SME[50%];Risk Management Software
7		Define High-Level Project Plan & Governance Struc...	10 days	7/4/25 8:00 AM	7/17/25 5:00 PM	5	Project Manager[50%];Project Sponsor[50%];Project Planning Software
8		Secure Project Funding & Approvals	5 days	7/18/25 8:00 AM	7/24/25 5:00 PM	7	Project Manager[50%];CFO
9		**Design & Architecture**	**70 days**	**7/25/25 8:00 AM**	**10/30/25 5:00 PM**		
10		Define Data Management Strategy & Architecture	20 days	7/25/25 8:00 AM	8/21/25 5:00 PM	8	Data Architect[50%];Security Architect[50%];Data Modeling Tool;Cloud Storage Tool
11		Set Up & Configure Project Collaboration Tools & Pr.	15 days	7/25/25 8:00 AM	8/14/25 5:00 PM	8	IT Architect[50%];Collaboration Tool Specilaist[50%];Collaboration Software
12		Design AI Development Infrastructure	25 days	8/22/25 8:00 AM	9/25/25 5:00 PM	10	AI Engineer[50%];Cloud Infrastructure Engineer[25%];Cloud Computing Platform
13		Design Cybersecurity Framework & Implementation.	20 days	8/22/25 8:00 AM	9/18/25 5:00 PM	10;11	Cybersecurity Architect[50%];Security Engineer[25%];Security Assessment Tool
14		Design Simulation & Testing Environment	20 days	9/26/25 8:00 AM	10/23/25 5:00 PM	12	Simulation Engineer[50%];Test Engineer[50%];Simulation Software
15		Finalize System Architecture & Design Documentatio	5 days	10/24/25 8:00 AM	10/30/25 5:00 PM	14	Systems Architect[50%];Documentation Specialist[25%];Documentation Tool
16		**Development & Integration**	**130 days**	**10/31/25 8:00 AM**	**4/30/26 5:00 PM**		
17		Develop Core Perception Algorithms	40 days	10/31/25 8:00 AM	12/25/25 5:00 PM	15	AI Engineer[50%];Sensor Specialist[50%];Sensor Data Acquisition Tool;Annotation Tool
18		Develop Decision-Making & Path Planning Algorithms	50 days	12/26/25 8:00 AM	3/5/26 5:00 PM	17	AI Engineer[25%];Robotics Engineer[25%];Simulation Environment
19		Develop Vehicle Control System Interface	40 days	12/26/25 8:00 AM	2/19/26 5:00 PM	17	Software Engineer[25%];Automotive Engineer[25%]
20		Integrate Perception, Decision & Control Systems	40 days	3/6/26 8:00 AM	4/30/26 5:00 PM	18;19	AI Engineer[25%];Robotics Engineer;Software Engineer[25%];Simulation Environment
21		Develop Sensor Fusion Algorithms	35 days	12/26/25 8:00 AM	2/12/26 5:00 PM	17	AI Engineer;Sensor Data Acquisition Tool
22		**Testing & Validation**	**70 days**	**5/1/26 8:00 AM**	**8/6/26 5:00 PM**		
23		Comprehensive Risk Assessment & Refinement	15 days	5/1/26 8:00 AM	5/21/26 5:00 PM	20;21	Risk Manager[50%];SME[50%];Test Engineer[50%];Risk Management Software
24		Develop Detailed Safety Protocols & Procedures	20 days	5/1/26 8:00 AM	5/28/26 5:00 PM	20	Automotive Engineer[25%];Legal Counsel[50%]
25		Extensive Simulation Testing & Validation	30 days	5/29/26 8:00 AM	7/9/26 5:00 PM	23;24	Test Engineer[25%];AI Engineer[25%];Simulation Engineer[25%];Simulation Software;Clou
26		Initial Closed-Track Testing & Validation	20 days	7/10/26 8:00 AM	8/6/26 5:00 PM	25	Test Engineer[25%];AI Engineer[25%];Safety Driver[25%]
27		**Regulatory & Pre-Launch**	**35 days**	**8/7/26 8:00 AM**	**9/24/26 5:00 PM**		
28		Prepare Regulatory Documentation & Submissions	25 days	8/7/26 8:00 AM	9/10/26 5:00 PM	26	Legal Counsel[25%];Regulatory Affairs Specialist[50%]
29		Plan Public Communication & Stakeholder Engageme	15 days	8/7/26 8:00 AM	8/27/26 5:00 PM	26	Communications Specialist[50%];PR Manager[25%]
30		Final Project Review & Lessons Learned	5 days	9/11/26 8:00 AM	9/17/26 5:00 PM	28	Project Manager;Documentation Tool
31		Secure Final Approvals & Prepare for Next Steps	5 days	9/18/26 8:00 AM	9/24/26 5:00 PM	29;30	Project Manager[50%];Project Sponsor[50%]

Appendix 5: Final Plan - WBS



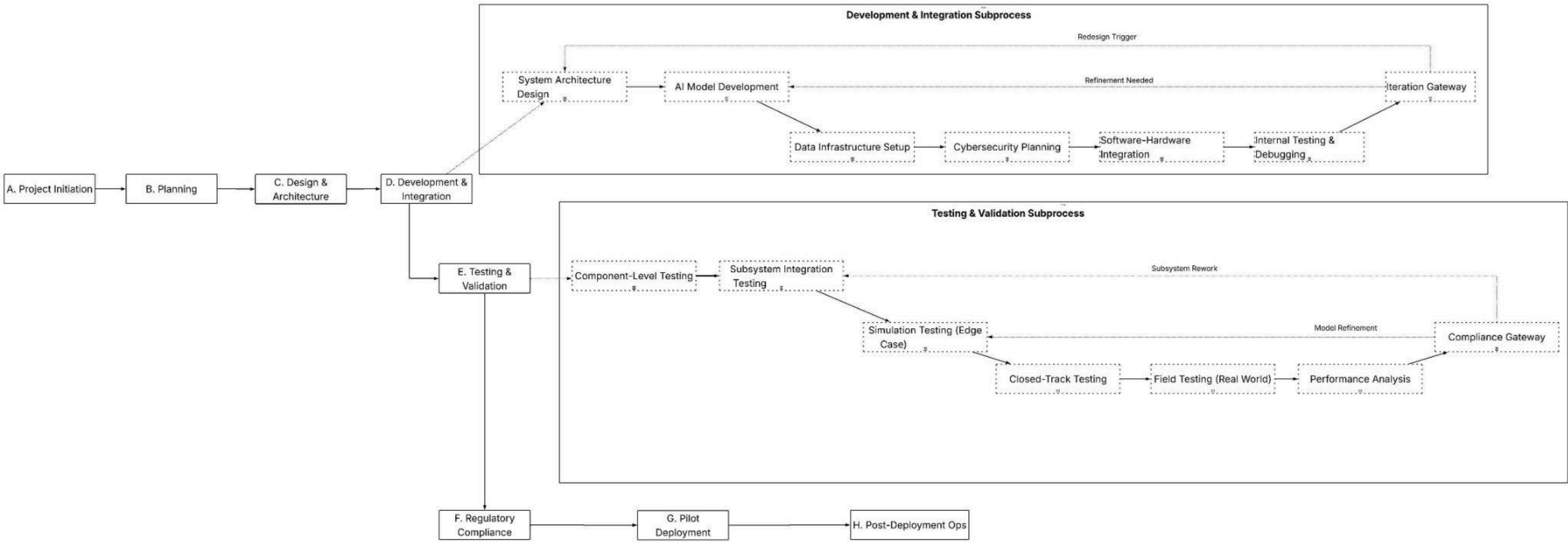
Appendix 6: Final Plan - Gantt Chart

Field	Total Allocation	Explaination
Research and Development (R&D)	AUD 300M - 400M	Autonomous car development is heavily R&D intensive. Includes AI & ML, sensor integration, non-AI software, simulation & testing. This includes: **AI & Machine Learning:** Core to autonomy; requires top talent and high-performance infrastructure. **Sensor Integration:** Critical for accurate perception and decision-making. **Non-AI Software Development:** Ensures seamless operation of vehicle systems. **Simulation & Testing:** Enables safe, large-scale validation before real-world deployment.
Information Systems Infrastructure	AUD 150M - 200M	A robust IS infrastructure is critical for managing the vast amounts of data, facilitating collaboration, ensuring security, and supporting the development process. This includes: **Data Storage & Management:** To handle large-scale sensor and training datasets. **Collaboration Tools:** Platforms for team coordination, sharing, and version control. **Cybersecurity:** Safeguards critical data and systems.
Engineering and Prototyping	AUD 200M - 250M	Building and testing physical prototypes is an essential part of the development process. This includes: **Vehicle Platform Acquisition:** For system integration and testing. **Hardware Integration:** Combining sensors and compute units. **Prototyping:** Iterative builds to detect and solve hardware issues early.
Regulatory and Legal	AUD 50M - 100M	Navigating the complex and evolving regulatory landscape for autonomous cars requires legal expertise and resources for compliance. This includes: **Legal Counsel:** Covers IP, liability, and regulatory strategy. **Certification & Testing:** Required for market approval.
Project Management and Administration	AUD 50M - 100M	Effective project management is crucial for coordinating the complex activities and ensuring the project stays on track and within budget. This includes: **PM Team:** Oversee timelines, risks, and execution. **Communication & Reporting:** Ensures stakeholder alignment and transparency.

Appendix 7: Cost Allocation

Success Criteria	Justification
Scalable and Secure Information Systems Backbone	Successful deployment of an IS architecture capable of managing high-volume data, computation, and security demands. Rationale: Critical enabler for AC development and operations.
Functional Autonomous Driving Platform (Alpha/Beta Stage)	Development of core AC capabilities—perception, decision-making, control—demonstrated in controlled environments with a clear path to further refinement. Rationale: Shows tangible progress beyond theoretical models.
Regulatory Milestone Achievement	Engagement with regulators and progress toward compliance with key safety and legal standards. Rationale: Essential for future deployment and market access.
High-Performing Multidisciplinary Team	Effective recruitment and integration of experts across AI, engineering, legal, and project management domains. Rationale: Project complexity requires coordinated, cross-functional expertise.
Comprehensive Risk Management Framework	Active implementation of a dynamic framework for identifying, mitigating, and monitoring project risks. Rationale: Vital for managing uncertainty and ensuring resilience.

Appendix 8: Project Success Criteria



Appendix 9: BPMN for the development of an Autonomous Car program

ID	Risk Description	Category	Probability (P)	Impact (I)	P x I Score	Initial Risk Rating
R1	AI Model Failure in Novel Scenarios: Autonomous AI model performs unpredictably or fails in previously unencountered, complex real-world driving situations, leading to accidents.	Technology / Safety	4 (Likely)	5 (Catastrophic)	20	Critical
R2	Cybersecurity Breach of Vehicle/IS: Malicious attack on vehicle software or cloud-based IT infrastructure, compromising safety systems, user data, or intellectual property.	Cybersecurity / Safety	4 (Likely)	5 (Catastrophic)	20	Critical
R3	Regulatory Approval Delays/Denial: Project experiences significant delays or outright denial of operational permits due to evolving, strict, or inconsistent autonomous vehicle regulations.	Regulatory / Legal	4 (Likely)	4 (Major)	16	Extreme
R4	Sensor System Malfunction/Degradation: Lidar, radar, camera, or ultrasonic sensors fail or degrade unexpectedly due to environmental factors (e.g., heavy rain, fog) or hardware defects, impairing perception.	Hardware / Safety	3 (Moderate)	4 (Major)	12	High
R5	Data Management Scalability Failure: Inability of data pipelines and storage to handle the massive volume of sensor data for training and validation, leading to bottlenecks and development delays.	Data / Infrastructure	3 (Moderate)	3 (Moderate)	9	High
R6	Scarcity of Specialized AI/Robotics Talent: Difficulty in recruiting and retaining highly skilled AI, robotics, and safety engineers, leading to project delays and quality issues.	Human Resources	4 (Likely)	3 (Moderate)	12	High
R7	High-Fidelity Simulation Environment Inadequacy: Simulation tools used for testing do not accurately replicate real-world conditions or edge cases, leading to undetected AI flaws.	Testing / Technology	3 (Moderate)	4 (Major)	12	High
R8	Supply Chain Disruptions for Critical Components: Unavailability or significant delays of specialized hardware components (e.g., high-performance computing units, specific sensors) due to global supply issues.	Supply Chain	3 (Moderate)	3 (Moderate)	9	High
R9	Public Acceptance/Trust Issues: Widespread public distrust or negative perception of autonomous vehicles due to highly publicized incidents or ethical concerns, impacting market adoption or regulatory support.	External / Reputation	2 (Unlikely)	4 (Major)	8	Medium
R10	Integration Complexities of Subsystems: Challenges in seamlessly integrating diverse hardware and software subsystems from multiple vendors, leading to unexpected conflicts or performance issues.	Integration / Technical	3 (Moderate)	3 (Moderate)	9	High

Appendix 10: Project-Specific Risk Identification and Initial Assessment

ID	Risk	Treatment Plan / Mitigation Actions	Cost Justification	Current (P x I)	Residual Risk (P x I)	Residual Risk Rating
	High Risks					
R4	Sensor System Malfunction/Degradation	> Implement redundant sensor systems. > Conduct rigorous environmental chamber testing (temp, humidity, vibration). > Regular, scheduled calibration checks. > Develop advanced sensor fusion algorithms to compensate for partial failures.	> Cost of additional sensor hardware is offset by the reduced risk of catastrophic failure and associated legal/reputational damages. >Cost of environmental testing is less than the recall costs.	12	3	Low
R5	Data Management Scalability Failure	> Implement cloud-native, scalable data lake architecture (e.g., S3, Azure Blob Storage). > Utilize distributed processing frameworks (e.g., Spark, Hadoop) for data ingestion and transformation. > Implement automated data archiving and lifecycle management.	Investment in cloud infrastructure and scalable tools is far less than the potential costs of project delays, lost development cycles, and inability to leverage data for AI improvement.	9	2	Very Low
R6	Scarcity of Specialized AI/Robotics Talent	> Partner with leading universities for talent pipeline and research collaborations. > Implement aggressive talent acquisition strategy (competitive salaries, benefits, visa sponsorship). > Foster a strong company culture with growth opportunities.	> High recruitment/retention costs are outweighed by the impact of project delays, subpar deliverables, or project failure due to lack of expertise. > Effective talent management is critical for project success.	12	4	Low

		> Invest in continuous internal training and upskilling programs.				
R7	High-Fidelity Simulation Environment Inadequacy	> Invest in cutting-edge simulation software and hardware platforms. > Continuously update simulation models with real-world driving data. > Implement "fuzz testing" and adversarial scenarios within the simulation. >Validate simulation against real-world test track data.	> Cost of advanced simulation tools is a fraction of the cost of real-world physical testing, accident investigation, and potential recalls if major flaws are missed. > Improves development speed.	12	4	Low
R8	Supply Chain Disruptions for Critical Components	> Establish multiple qualified suppliers for critical components. >Maintain buffer stock for long-lead-time items. Sign long-term supply agreements. > Explore regional sourcing alternatives.	Cost of inventory is less than the impact of supply chain disruption.	9	3	Low
R10	Integration Complexities of Subsystems	> Adopt a modular architecture with clearly defined APIs and interfaces. > Implement continuous integration/continuous deployment (CI/CD) pipelines for frequent, automated testing of integrated components. > Utilize robust version control and configuration management.	Investment in architectural planning and automated testing tools significantly reduces rework, debugging time, and potential costly delays from integration issues.	9	4	Low
	Extreme Risks					

R3	Regulatory Approval Delays/Denial	> Establish a dedicated regulatory affairs team. Engage proactively and frequently with regulatory bodies and standards organizations. >Develop a robust documentation and safety case strategy aligned with emerging standards (e.g., ISO 26262, UL 4600). > Conduct mock audits.	Proactive regulatory engagement and robust documentation reduce the likelihood of costly delays, rework, or market exclusion, preserving the substantial R&D investment.	16	6	Medium
	Critical Risks					
R1	AI Model Failure in Novel Scenarios	> Implement diverse, redundant AI architectures. Utilize extensive, varied, and augmented training datasets. > Employ formal verification techniques and safety-by-design principles for AI. > Implement a robust safety assurance framework (e.g., safety driver, fail-operational modes). > Establish a "Safety Case" methodology for AI behavior.	The cost of comprehensive AI testing, redundancy, and safety assurance (e.g., extensive simulation, safety drivers) is substantial but minimal compared to the multi-billion-dollar liability, reputational ruin, and project failure arising from a critical safety incident.	20	8	Medium
R2	Cybersecurity Breach of Vehicle/IS	> Implement a multi-layered security architecture (e.g., secure boot, intrusion detection/prevention, secure over-the-air updates). > Conduct regular penetration testing and vulnerability assessments by third parties. > Adhere to cybersecurity standards (e.g., ISO 21434). Establish a dedicated cybersecurity incident response	Investment in proactive cybersecurity measures (e.g., penetration testing, security frameworks) is significantly less than the financial and reputational damage from a major breach, legal fines, and potential vehicle recalls.	20	8	Medium

		team.				

Appendix 11: Risk Treatment Plans

9. Reflection

48094366 - Manasi Pragnesh Lotia

I feel genuinely motivated by this project. It's not just technically challenging, but also meaningful — working on something as forward-looking as autonomous vehicles makes me feel like I'm contributing to the future of mobility and technology. Collaborating with my team on this assignment has been both a rewarding and a pleasant learning experience. We brought together different ideas, navigated complex planning decisions, and supported each other. From what I've seen, this project should be a high priority for the Agency Executive. It aligns with strategic goals, has strong innovation potential, and could position the agency as a leader in smart transport solutions. I wouldn't recommend against the project, but I do believe it needs strong commitment from leadership and a solid plan to handle its risks. With the right support, it's a project worth pursuing.

47987731 - Ojaswi Kafle

Since our project initiative aligns with new priorities in autonomous transportation and AI integration, we have high trust in it. From a consultant's perspective, this initiative would be rated as a high priority for the Agency Executive, not only for its innovation potential but also for its role in shaping regulatory, technology, and institutional goals. We do not advise against the project. However, a phased and controlled execution strategy, early and sustained collaboration with regulators, and proactive public engagement are required to ensure transparency and trust. This is necessary for overall success. This project has the potential to establish itself as a milestone in the creation of responsible autonomous cars with the correct governance and stakeholder alignments.

48229105 - My Linh Do (Jennie)

Our AC information-system initiative is well-situated to explore emerging mobility, artificial intelligence, and safety-critical system trends. From my standpoint as a consultant, I would consider this project to be a high-priority,, high-impact investment, since it offers strategic objectives in technical leadership, strong economic competitiveness, and a pioneering position in public-sector innovation. The hybrid approach that blends AI-driven analytics with human oversight gives me confidence in its deliverability. I see no fundamental reasons to oppose the project. Nevertheless, its ultimate success relies heavily on disciplined risk governance, transparent communication, and proactive outreach to build trust & social license. This programme has the potential to become the benchmark for the responsible deployment of AC development programmes.

48183628 - Xuan Phuc Tran (Teddy)

This autonomous car initiative provides tremendous value: placing the agency at the vanguard of intelligent transport innovation, pioneering the use of AI, and establishing a new standard for safety-critical infrastructure. It has strong potential to catalyze both technological and economic leadership and value over the long term. But should the project get the green light, several difficult-to-solve challenges will require careful management: high technological sophistication, shifting regulatory environments, and the imperative need to find and manage specialized skills and risk mitigation. There are no easy barriers to overcome. However, by developing the hybrid project plan, I think that it's possible to solve these challenges. By considerably separating into phases, keeping engaging actively with stakeholders, and having in place a rigorous risk management system, it's possible to move forward with confidence. In my role as a consultant, this is a high-priority initiative that is valuable and manageable.

48395692 -Nguyen Thu Trang (Tracy)

This assignment was a great opportunity to explore the role of AI as a tool in complex project planning and risk management. While the AI-generated plans from ChatGPT and Gemini provided solid starting points, especially in structuring ideas, timelines, and risk considerations, they also revealed certain limitations. These included overengineering resource allocation or oversimplification of real-world complexities and a lack of context-specific planning. For me, the true strength of AI lies not in replacing human input, but in enhancing it. Our group's final hybrid plan demonstrates how AI can be effectively used as a supportive framework,, accelerating initial ideation; however, it is human expertise, domain knowledge, and critical thinking that refine and adapt these foundations into something realistic and actionable.