Project Closure Report

Project Name: Prediction of Brake Pad Using ANN

Prepared By

Document Owner(s)	Project/Organization Role
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1 PROJECT CLOSURE REPORT PURPOSE

Project Closure Report Purpose
The Project Closure Report serves as the ultimate project document, employed by senior management to evaluate the project's success, pinpoint best practices for future endeavors, address any outstanding issues, and officially conclude the project.

2 PROJECT CLOSURE REPORT GOALS

Project Closure Report Goals
The purpose of crafting this Project Closure Report is to achieve the following objectives: - Scrutinize and affirm the project's milestones and overall success. - Verify outstanding issues, risks, and recommendations. - Articulate the tasks and activities necessary for concluding the project. - Highlight project achievements and identify best practices to inform future endeavors.

3 PROJECT CLOSURE REPORT SUMMARY

3.1 Project Background Overview

Project Background Overview
The project was initiated to enhance the efficiency of preventive maintenance for heavy vehicle brake pads. With a focus on optimizing the lifespan of brake components, the primary objectives include minimizing downtime and ensuring heightened safety standards for the entire vehicle fleet. The impetus for this project stems from the imperative to streamline maintenance practices, ultimately contributing to the overall performance and reliability of heavy vehicles. Detailed information can be found in the project overview statement and/or project charter.

3.2 Project Highlights and Best Practices

Project Highlights and Best Practices
Project Highlights: - Significantly improved the efficiency of preventive maintenance procedures for heavy vehicle brake pads. - Successfully minimized downtime across the entire vehicle fleet, enhancing overall operational continuity. Best Practices: - Implemented a proactive maintenance schedule, optimizing the lifespan of brake components. - Utilized advanced diagnostic tools to identify potential issues, allowing for timely and targeted maintenance interventions.

3.3 Project Closure Synopsis

Project Closure Synopsis
The decision to close the project is rooted in the successful completion of all project objectives and deliverables. With every milestone achieved and all outlined tasks fulfilled, the project has met its intended goals. The closure is a result of reaching the desired outcomes rather than external factors such as a loss of funding or a strategic shift.

4 PROJECT METRICS PERFORMANCE

4.1 Goals and Objectives Performance

Goals and Objectives Performance
The actual project performance surpasses the initially set objectives. The anticipated benefits, including heightened operational efficiency resulting from reduced unscheduled downtime and accidents, have been realized. Additionally, substantial cost savings have been achieved, attributable to a notable decrease in both maintenance expenses and emergency repair occurrences. The project has effectively delivered on its promises, exceeding the expected outcomes outlined at the project's initiation.

4.2 Success Criteria Performance

Success Criteria Performance
The project successfully met all its goals and criteria. Everything was achieved as planned, thanks to careful planning and teamwork. Ongoing progress will be monitored by those responsible for maintaining the project's standards.

4.3 Milestone and Deliverables Performance

Milestones and Deliverables Performance
All project milestones and deliverables met high-quality standards, satisfying customer expectations. The team executed tasks meticulously, ensuring no deliverables fell short. There were no delays or issues, and the project consistently upheld a commitment to quality and customer satisfaction, achieving all goals on time.

4.4 Schedule Performance

Schedule Performance
Project Schedule Overview: At the beginning, the project schedule was thoroughly planned and documented, encompassing major phases, milestones, and job dependencies. It included a Gantt chart and a milestone tracking system, giving a complete picture of the project's chronology. Project Schedule Control Process: A thorough schedule control procedure was built throughout the project's duration. Regular meetings were held to compare the project schedule to actual progress and ensure alignment with goals. Analyses of variance and performance reports were used to identify deviations and conduct corrections as soon as possible. Project Schedule Corrective Actions: Any deviations or possible delays were addressed swiftly and diligently. This involved reallocating resources, prioritising tasks, and, if required, renegotiating timetables with stakeholders. There were contingency preparations in place to deal with unanticipated schedule interruptions.

Project Schedule Integration with Managing Project:

The project schedule was an essential component of the entire project management strategy. It was aligned with the project scope, budget, and resource allocation by synchronizing with project management tools and processes. The programme remained dynamic and adaptable to project demands thanks to regular updates and communication.

4.5 Budget Performance

Budget Performance

Project Budget Overview:

The project budget was rigorously prepared and organised to match with the scope and objectives of the project. It included all expected expenditures, such as staff, equipment, supplies, and contingencies. To guarantee accuracy and conformity with financial objectives, detailed cost estimation and forecasts were performed throughout the project's inception phase.

Throughout the project's existence, the budget was continuously evaluated and recorded against actual expenditures. Comprehensive documentation and financial records were kept, ensuring budgetary openness and accountability.

The total project cost estimate was calculated to be RM 863,500. The budget allocation was broken down across various work packages (WBS Level 1) as follows:

1. Initiation - RM 375,000 (43.42% of the total project cost estimate)

- Project Manager: RM 85,000
- Data Scientist: RM 80,000
- ML Engineer: RM 70,000
- Software Developer: RM 60,000
- Hardware Developer: RM 60,000
- Contingency (15% of software development and testing): RM 20,000

2. Hardware - RM 55,000 (6.37% of the total project cost estimate)
- Cloud Service: RM 50,000
- Servers: RM 5,000
3. Software - RM 80,000 (9.26% of the total project cost estimate)
- Licensed Software: RM 10,000
- Software Development: RM 70,000
4. Testing - RM 12,000 (1.39% of the total project cost estimate)
5. Training and Support - RM 191,500 (22.18% of the total project cost estimate)
- Trainee Cost: RM 10,000
- Travel Cost: RM 6,000
- Data Scientist: RM 52,000
- ML Engineer: RM 45,500
- Software Developer: RM 39,000
- Hardware Developer: RM 39,000
6. Reserves - RM 111,600 (12.92% of the total project cost estimate)

Project Budget Corrective Actions:

Efforts were taken to keep the project under the authorized budget. Any variations or departures from the budgeted costs were carefully examined and handled. This entailed adopting cost-cutting initiatives where possible, reallocating resources efficiently, and obtaining permission from the right stakeholders for any required budget modifications.

Contingency reserves were used sparingly to meet unanticipated expenditures while minimizing the overall project financial effect. Continuous budget monitoring and proactive budget management enabled prompt actions to preserve financial control.

4.6 Metrics Performance Recommendations

Metrics Performance Recommendations
The selection and monitoring of effective metrics are key components of project success. The recommendations that follow are intended to enhance and optimize the approach to measuring performance for future projects. These recommendations are intended to improve

decision-making, track progress more effectively, and promote continuous improvement throughout the project lifetime.

1. Refine Metric Selection:

   Choosing the appropriate metrics is critical for properly assessing project progress. This guideline emphasizes the need of properly aligning selected metrics with the overall project objectives, particular key performance indicators (KPIs), and success criteria. Metrics should include both quantitative and qualitative measurements that correctly reflect the development of the project. The objective is to ensure that the metrics chosen give useful insights and help in decision-making throughout the project lifecycle. This entails a careful examination of which metrics effectively capture progress at various phases of the project, ensuring that they are actionable and relevant to the project's objectives.

2. Regular Performance Reviews:

   Regular and regular performance evaluations are critical for sustaining project momentum and responding quickly to deviations from projected outcomes. Setting up a regular timetable for evaluating metrics allows teams to reliably measure progress against set goals. These assessments give a chance to uncover any differences or areas that require correction as soon as possible. By doing these reviews at regular intervals, the project team gets the capacity to make educated judgements and take corrective steps on time, ensuring the project continues on track.

3. Learning from Outcomes:

   Learning from project results entails doing extensive post-project reviews of the efficacy of selected measures. This approach seeks to determine how well these measures correctly reflected the project's real development and success. Teams can find opportunities for development by analyzing the strengths and weaknesses of the chosen metrics. Documenting these lessons and exploiting them for future projects aids in the refinement of the metric selection and measurement methods processes. It is an opportunity to constantly adapt and optimize the measurement approach, ensuring that future initiatives benefit from the lessons acquired.

These guidelines emphasize the significance of strategic measure selection that is connected with project objectives, frequent performance assessments, and learning from prior results. Implementing these techniques can greatly improve the project's capacity to successfully assess progress and make informed decisions for future endeavors. Specific project needs and organizational environments can be accommodated through modifications.

5 PROJECT CLOSURE TASKS

5.1 Resource Management

Resource Management

Resource management was critical in organising skill sets and capabilities to fit with shifting project objectives in the project aimed at predicting brake pad wear out using Artificial Neural Networks (ANN).

1. Changes in resources needs

- Adaptation of Skills: At the outset of the project, we focused on data analysis, programming, and machine learning fundamentals. We saw the need of adding automotive and brake system knowledge as the project developed, so we sought advice from specialists in these domains.
- Testing and Validation: As we progressed through the predictive model testing process, we recognised the necessity for persons educated in quality assurance procedures as well as those knowledgeable in the automotive sector for correct model validation.

2. Steps for Shifting Project Resources:

- Skill and Assesment: We assessed each team member's talents to determine how they may fit into different project responsibilities, allowing a smooth transfer without disrupting the existing project.
- Collaboration and Agreement: Our team leaders met with other project groups to discuss resource allocation in order to guarantee a fair distribution of talents and efforts among multiple projects, benefiting everyone involved.

- Sharing Project Insights: Team members who were departing the project presented seminars to pass on their skills, covering topics such as coding methodologies and model building tactics.

3. Capturing and Retaining Project Knowledge:

- Efforts in Documentation: We recorded our models, data processing procedures, and any insights acquired throughout the project, preserving this information in a single repository for future reference.
- Knowledge Preservation: Knowledge-sharing meetings and extensive technical documentation were critical for preserving our project's learnings. Encouragement of collaboration and exchange of experiences aided in the transfer of key ideas to future project teams.

5.2 Issue Management

Issue Management
1. Outstanding Issues: ● Data Quality: Some discrepancies were discovered in the gathered braking system data, compromising the prediction models' accuracy. ● Overfitting of the ANN model: The ANN model has a tendency to overfit specific data patterns, resulting in decreased generalisation capacity for real-world brake pad wear forecasts. ● Limited access to computational resources and scheduling restrictions hampered comprehensive testing and optimisation of the prediction model. 2. Resolution plan to resolve each issue : ● To resolve data discrepancies, Amir and Nawal will work together to undertake data cleaning procedures and explore more data sources or refining approaches to improve dataset quality. ● Model Optimisation: Adam and Farihah will concentrate on improving the ANN architecture, adopting regularisation approaches, and undertaking feature engineering to reduce overfitting concerns. ● Resource Allocation: The team will investigate alternative computer resources available at the institution and optimise the workflow to make the most of the available resources.

3. Reporting Progress:

- Responsibility for Issue Resolution: Each team member will assume responsibility for certain issues. Regular team meetings will be conducted to discuss issue resolution progress updates.
- Structure of Reporting: Weekly progress reports will be distributed to the team. Amir will monitor data quality improvements, Adam and Farihah will oversee model optimisation, and Nawal will keep an eye on resource optimisation initiatives.

5.3 Risk Management

Risk Management
Project Risks Mitigated: 1. Data Quality Issues: Addressed by using extensive data cleaning and preprocessing approaches to reduce errors in the brake system dataset. 2. Model complexity is managed by beginning with simpler model designs and progressively adding complexity while monitoring performance to avoid overcomplicating the ANN model. 3. Limited Computing Resources: Reduced by optimizing code and investigating cloud-based solutions or university resources to efficiently manage computational requirements. Outstanding Project Risks: 1. Validation Accuracy: Ensuring the model's accuracy in real-world brake pad wear prediction situations is still an issue, affecting the model's dependability and usability. 2. Time constraints: A lack of time for full model testing and optimisation may make it difficult to achieve the requisite accuracy and resilience within the project timetable.

5.4 Quality Management

Quality Management

Quality management techniques were critical throughout our study on forecasting brake pad wear using Artificial Neural Networks (ANN). Amir and Nawal rigorously validated and cleaned the braking system datasets, discovering and correcting errors in order to retain data integrity. Adam and Farihah tested and validated the ANN models thoroughly, using cross-validation techniques and a variety of dataset tests to determine robustness and reliability. Weekly team meetings allowed for in-depth quality talks, allowing for the prompt discovery and correction of any concerns. We created a culture of continuous improvement by documenting lessons gained and using them to better future project revisions. Each team member, Amir, Adam, Nawal, and Farihah, was critical in maintaining quality across data, models, and code, ensuring a coherent approach to meeting project objectives.

5.5 Communication Management

Communication Management

Project Communication Process Outline :

1. Weekly Team Meetings: Amir, Adam, Nawal, and Farihah met weekly to review project progress, difficulties, and assigned duties. Each member shared information and offered updates on their various fields, facilitating teamwork and information exchange.
2. Communication channels: The team used communication channels such as WhatsApp for real-time conversations, resource sharing, and answering rapid questions.
3. Documentation and sharing: Google Docs, for example, functioned as a central store for project documentation, datasets, and code. Everyone on the team had access to project documents, which encouraged collaborative editing and version control.

Effectiveness of Communication Process :

The communication approach was really effective in terms of providing regular updates, pooling resources, and quickly addressing difficulties. Team members were kept up to date on project developments and could quickly cooperate on assignments.

Changes Made During The Project :

Initially, official updates were provided through regular team meetings, but the inclusion of a Whatsapp group increased real-time communication by promoting more engaged and quick conversations among team members.

5.6 Customer Expectation Management

Customer Expectation Management
Initially, the team of Amir, Adam, Nawal, and Farihah, all university students, methodically gathered requirements through comprehensive meetings with project stakeholders. Understanding the stakeholders' intended accuracy levels, usability requirements, and overall scope of the predictive model targeted at forecasting brake pad wear using ANN was required. Setting realistic milestones became critical as the team communicated to stakeholders feasible goals and project phases. This organized approach guaranteed that stakeholders' expectations and project progress were in sync. Regular updates gave constant insights into accomplishments, obstacles, and changes from the original plan, promoting openness and effective expectation management. Furthermore, regular prototype model demos allowed stakeholders to visualize progress, give input, and revise their expectations based on the model's increasing functionality. Stakeholder requirements changed during the course of the project. Initially concerned with accuracy, stakeholders eventually stressed the model's interpretability and practical applicability in real-world circumstances. This move revealed a more developed knowledge of the challenges involved in predicting brake pad wear. As a consequence, the project's scope was slightly adjusted to guarantee alignment with attainable objectives and stakeholders' growing demands. The team stayed adaptive, adapting changes in expectations

to ensure that the project's progress and capabilities were always in sync.

5.7 Asset Management

Asset Management

1. Remaining Assets at Project's End:
- Data Repositories: Github stores compiled braking system datasets and supporting documentation.
- ANN models, code repositories, and technical documentation were developed and stored in the project's repository.
- Computing resources, laptops, and hardware devices used in model creation and testing are referred to as project hardware.

2. Plans for Disposition:
- Data Repositories: The brake system datasets, together with documentation, will be archived at the Github for future study or instructional reasons.
- Code and Models: The created codebase, models, and technical documentation will be organized, cleaned, and kept in a secure repository that future students or academics interested in extending the project will have access to.
- Project Hardware: The computing resources and hardware devices will be returned to the assigned university department, ensuring that they are available for future academic initiatives.

3. Management of the Disposition Process:
- Amir, Adam, Nawal, and Farihah monitor the disposition process together, allocating responsibility for organising and archiving assets suitably.
- Documentation and Reporting: The team will produce a complete inventory report documenting the dispositioned assets, their location, and necessary instructions for future access and send it to the university's academic department for record-keeping.

5.8 Lessons Learned

Lessons Learned

1. Successes:

- Collaborative Teamwork: Amir, Adam, Nawal, and Farihah all contributed considerably to the project's success. Regular team meetings and open communication promoted a collaborative environment, allowing for more efficient advancement and information exchange.
- Structured Task Management: Fairly giving each one their own part as a task management was advantageous. It provided unambiguous work allocation and monitoring, as well as ensuring everyone was on the same page with their duties, improving project organization and efficiency.
- Thorough Data Validation: Amir and Nawal's careful data validation approach confirmed the braking system datasets' dependability. This improved the prediction models' accuracy and resilience.

2. Areas for Development:

- Improved Model Interpretability: While the model's accuracy was remarkable, increasing its interpretability for stakeholders might improve its practical utility. Future iterations might concentrate on creating more interpretable models while maintaining accuracy.
- While Google such as Google Documents was effective for storing code, enhancing version control and integrating collaborative code editing capabilities might further improve code collaboration.
- Time Management Optimisation: Despite reaching the majority of goals, optimizing time management, particularly during the model optimisation phases, might have resulted in more thorough testing and robustness checks being completed within the timeframe.

5.9 Postproject Tasks

Postproject Tasks

1. Documentation and Reporting:

- One of the most important responsibilities after successfully finishing the project on forecasting brake pad wear using ANN is to painstakingly organise and collect all project-related documentation. As the project assistant, Amir is in charge of managing this phase. Reports, technical documents, code repositories, databases, and any other relevant items must be gathered. Amir verifies that all documents follow university requirements and are properly structured for submission. Simultaneously, Adam, as project manager, collaborates closely with Amir to ensure the documentation's completeness and correctness. The goal of this phase is to produce a complete archive that captures the project's path, techniques, and outcomes for future reference and academic reasons.

2. Knowledge Transfer and Lessons learnt:

- As developers, Adam, Nawal, and Farihah work to capture the lessons learnt throughout the project's lifespan. This includes highlighting accomplishments, correcting problems, and making recommendations for potential future initiatives. The goal is to record priceless insights and experiences obtained during the predictive model building process. This information transfer guarantees that the team's cumulative learning improves future project outcomes. Adam leads this work, supporting team conversations to turn these lessons into useful insights for future endeavors.

3. Project Closure Approval:

- As project manager, Adam is in charge of obtaining official closure approval from the Project Sponsor or faculty adviser. This final phase is organizing a closing meeting to offer a thorough evaluation of the project's tasks, deliverables, and outstanding items. Adam checks that all written requirements have been accomplished and obtains confirmation from the Project Sponsor that they are pleased with the project's results. This closing clearance marks the project's formal completion and guarantees that all stakeholders are satisfied with the project's execution and deliverables.

5.10 Project Closure Recommendations

Project Closure Recommendations

As the experiment on forecasting brake pad wear with ANN nears completion, numerous critical closure proposals have surfaced. By organizing a closure meeting, Adam, as project manager, should begin the process of requesting formal closure permission from the Project Sponsor or academic adviser. This meeting will offer a detailed evaluation of project tasks, outcomes, and outstanding items, ensuring that all written requirements are met. Concurrently, as project assistant, Amir is in charge of meticulously organizing and preserving project-related paperwork, assuring conformity with university requirements. Furthermore, before obtaining closure permission, Nawal and Farihah, the developers, undertake a last assessment of deliverables to ensure conformity with the project's initial objectives. Furthermore, Adam, Nawal, and Farihah working together to write lessons learned promotes knowledge transfer by documenting accomplishments, problems, and recommendations for future initiatives. These suggested actions, lead by Amir, Adam, Nawal, and Farihah, provide a thorough, educated, and well-documented conclusion to the predictive brake pad wear project, allowing for future reference and continual development.

6 PROJECT CLOSURE REPORT APPROVALS

Prepared By _____

([**Job Title**])

Approved By _____

([**Job Title**])

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([**Job Title**])

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([**Job Title**])

Approval Date _____

7 APPENDICES

7.1 Project Closure Report Sections Omitted

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