Computer Vision/Machine Learning Project Proposal

1.1 **What is the business problem that needs solving?**

Currently, our organization is using human labour to inspect and detect the semi-completed product and completed product for manufacturing defects at our production plant. The production plant manager has notice inconsistency in quality based on feedback from our corporate and retails customers. The plant manager has requested IT and Engineering division assistance to initiate a joint working task force together with all relevant stakeholders to explore ways to improve the reliability and accuracy of the product defect inspection process at our manufacturing plant.

The IT and Engineering division proposed automating the production plant defect inspection process through the design, development, testing and deployment of an automated product defect inspection system using computer vision and machine intelligence, which is a part of a new technology known as Artificial Intelligence.

1.2 **How can AI solve this problem?**

The team with all stakeholders unanimously agreed that using human labours to inspect our semi-finished and finished product is taxing for human inspectors as the work shift duration is 8 hours, human inspector performance could change or degrade over work hours. That creates a probability of failure to detect some of the product defects that slip through the production line and shipped to customers.

The IT and Engineering division had proposed automation of product defect inspection using computer vision and machine learning algorithms to decide the quality of product produced at our production plant based on simple binary criteria: good or bad based on real-time computer vision and machine learning model analysis of product inspection. The role of computer vision is to capture image instances of a product and the machine learning model is to decide whether the product is good or bad. The project requires a financial investment ranging from an investment of new hardware and software tools such as computer system, vision system, lighting system, software and a new skill set training in the area of computer vision and machine learning.

If the project is approved, the team will start computer vision data collection in parallel with human inspectors to identified and classify instances of good and bad product images. The data collection stage is necessary as the proposed AI project is data-driven and relies upon a huge

amount of computer vision data to train the machine learning model. Once, the new system is trained, it is deployed on small scale to determine its performance, a fine of the machine learning model is expected before the system is fully deployed into production in stages. It is estimated the project could take 18 months to complete.

1.3 **What are tools/resources needed to implement the solution?**

The resources that this project requires are:

1) Initial hardware resources such as high-performance Intel or AMD based computer system with NVIDIA GPUs, a high-performance computer vision system and a high lumen lighting system. Depending on the size and cost, the expansion of the current hardware system or a cloud computing option may become a future option.
2) Software resources such as Python 3.8 with its associated libraries for machine learning and TensorFlow and Pytorch to implement CNNs.
3) A computer security system, may consist of both software and hardware security box to protect the system and its data.
4) Skills AI project manager and AI engineers with relevant experience in implementing computer vision and machine learning model.
5) Training investment in upgrading skills of internal employees to manage and handle AI system and maintenance. The investment is necessary to maintain the current system and undertaking more future AI projects.

1.4 **What ethical challenges might arise?**

The ethical challenges of this project are whether, to be honest upfront with human inspectors about the project when seeking their cooperation during the data collection phase of the artificial intelligence project. There are two concerns:

1) It will be unethical to hide the truth from affected workers. How to address their reaction if they know that the project will replace their role.
2) How to address human inspectors concerns about their job security.

1.5 **What are some tactics for addressing these ethical challenges?**

The best option is, to be honest upfront with human inspectors about the project when seeking their cooperation during the data collection phase of the artificial intelligence project. The solution to their concerns is to provide opportunities to retrain human inspectors as a technician to maintain the new AI system depending on their willingness and education background. The alternate option is to provide training for a new role outside manufacturing or help them to transition to new opportunities outside the organization.