CHAPTER 1. INTRODUCTION

1.1 Background

Nowadays, managing the company in knowledge era is different from managing a company in manual or industrial revolution era. In knowledge era, a company is required to be able to continue adapting changes very quickly to produce outcomes that impact on the sustainability a company. The speed of change in this era is supported by technological developments which have characteristics increasing the complexity of problems, rapidly obsolete knowledge, and the patterns of development political, social, economic, and cultural is unpredictable (Jann, 2006).

For a company in knowledge era can adaptable the demands of change and survive from bankruptcy, it takes a learning organization that contains a group of people who continue to improve their ability to achieve the goal. In a learning organization needs the people who are required to have competencies to able facing and dealing with global business competition, people with capable moral values and knowing how to develop themselves, and people who capable of finding new way or methods according to the demands of the times (Jann, 2006)

Impact of the learning organization is increasing organization capability to achieve their strategic goals. Moreover, the company will more quickly improve employee welfare, if the company understands the capabilities needed and what needs to be done to achieve strategic objectives. Furthermore, it must be continuously done until the organization finds and deepens knowledge. To increasing organization capability, a company must be supported by systematic process and steps in managing knowledge. With that support, the organization capabilities will develop faster and accelerate value creation that can improve company competitive advantage. This case suggests that company has taken the initiative to develop a strategy for increasing organizational capability with knowledge management based on critical knowledge identification result.

1.2 Company History

PT Dirgantara Indonesia is a State-Owned Enterprise that focuses on making transportation modes and aircraft components. PTDI is also the largest aircraft manufacturing company in Southeast Asia. Since was established in 1976, PTDI has core competence in designing and producing the aircraft. Also, PTDI can develop an aircraft, including developing aircraft structures, aircraft assembly, and aircraft maintenance both for the civil and military aircraft.

For almost 41 years developing aircraft business, PTDI has become a significant model in the development of the aviation industry in Indonesia. The journey taken in developing aircraft products requires a long process. One of them PTDI can prove the capability of transfer technology on a fix-wing aircraft. This journey can be seen by PTDI product development in aircraft below:

- **Workshop in Independence Era**

At 1953 the AURI Experiment Section was established, in which four years later it was turned into a Sub Depot of Manufacture, Research, and Development under the Command of Aircraft Engineering Depot led by Major Nurtanio Pringgoadisurjo.

- **Lembaga Persiapan Industri Penerbangan (LAPIP)**

In 1960, the Sub-Depot was upgraded to be Lembaga Persiapan Industri Penerbangan (LAPIP) or, loosely translated, Aviation Industry Preparatory Body. Here, Nurtanio and his colleagues designed and built several experimental aircrafts like *Sikumbang*, *Belalang 85/90*, *Kunang*, *Super Kunang*. In 1966, after political turmoil in Indonesia, LAPIP once again upgraded to became Lembaga Industri Penerbangan Nurtanio (LIPNUR). The LIPNUR attempt to re-engine an agricultural aircraft, the Czech's PZL *Wilga* under licence and named it *Gelatik*. The same licencing approach was also made with a two-seat basic trainer aircraft Pazmany's PL2 that known in Indonesia as LT 200. Looking at this, Indonesian aviation industry approach

to knowledge by building aircraft through licencing and then try to modify them has appeared since the early beginning.

- **Establish Aircraft Industry + Change Nurtanio + New Paradigm**

After LIPNUR, Indonesia government decided to launch an aviation industry company officially. Personnel and facilities of LIPNUR now assigned under PT Industri Pesawat Terbang Nurtanio (PT IPTN). The three steps philosophy of aviation technology mastery introduced by Habibie consist of the following:

a) The first phase utilises existing technology by making aircraft under licence or subcontract and offsets program from another aviation manufacturer. This phase concentrate on mastering proper technology, quality control, and project management for manufacturing, assembling, and production testing of the licenced aircraft. In August 1976, Industri Pesawat Terbang Nurtanio was formed by then President Soeharto. The main program of this new company was to manufacture NBO105s and NC-212-200s, respectively licenced from German's MBB and Spain's CASA.

b) Following the Habibie philosophy, after found a firm foundation on a manufacturing process with the licenced product line, Indonesia moved forward to the second phase by began to design and certify a large aircraft. As risk (and cost) sharing, Indonesia decided that it requires a partner to develop a cargo/passenger aircraft based on Lockheed C130 *Hercules* but in a smaller size. This way it can gain experience in designing and producing Part 25 aircraft. Nurtanio brought Spain's CASA and formed a 50/50 joint venture company called Airtech in 1979. The result was an Airtech's CN235-10 which flew for the first time in December 1983.

Total of 20 aircrafts of this early variant was produced and sold to customers. Both CASA and Nurtanio made ten aircrafts each. The production was divided between the two companies and is maintained until today. For every CN235 aircraft out there, the outer wings, rear fuselage and tail section came from Bandung factory, while the forward fuselage, centre wing, and nacelles came from Spain. Each

company manufactured their centre fuselage and other minor parts. After the first 20 aircrafts were delivered, Airtech then dissolved with each parent company retain the type certificate for the CN235 granted by their country own safety authority. The two companies then developed the basic CN235 into their later variants. CASA (which later merged into EADS Airbus Military) developed -100, -200, and -300 while PTDI developed -110, and -220. On 1984, PT Industri Pesawat Terbang Nurtanio renamed into PT Industri Pesawat Terbang Nusantara (PT IPTN).

c) The third phase depends on Indonesian engineer's capability nurtured during the previous phase to independently designed, manufactured, and flown their aircraft. The star of this phase was N250 prototypes that first flew in August 1995. Due to Asian monetary crisis in 1996-1997 any development of new aircraft type. PTDI reserved to selling existing product line and engineering services to survive, in addition to laying off 8,000 of its employee from 12,000 to just below 4,000. Then President Abdurrahman Wahid changed PT IPTN into PT Dirgantara Indonesia in the year 2000 with high hope that it would bring a fresh spirit of professionalism and good corporate governance to the dying industry. To maintain the relevance of the CN235, PTDI released some upgrade variants of the model. The company is also maximising potential revenue utilising "leftover" non-core business assets like component/detail parts manufacturing and aircraft engine maintenance. This turn out could bring PTDI out from the pit and maintain its presence. Up to this day, PTDI-manufactured parts can be found on various aircrafts sold by Airbus, Boeing, and Airbus Helicopters.

1.3 Company Vision and Mission

Vision

"To be a world class aerospace company based on high technology mastery and cost competitiveness in the global market."

Mission

- As the centre of competence in the aerospace industry for both commercial and military mission, as well as for non-aerospace application.
- As a major player in the global industries, which has a strategic alliance with other world class Aerospace Industries,
- Cost competitive business.
- Delivering cost competitive products and services

1.4 Company Organizational Structure

To run the business process, PTDI has an organizational structure (see Figure 1.1) that can support PTDI achieve the target. Company organizational structure consists of one President Director with five Directorate who led by Director in each and one business unit, Aircraft Services who have a direct report to President Director. Each Directorate has duties and responsibility as following:

a. Finance Directorate: responsibility to manage and manage the company's finances
b. Commercialization Directorate: Responsibility to conduct market potential study, marketing, and sales activities
c. Administration and Human Resources Directorate: responsibility to manage human resource development, corporate business process support facilities, and develop information technology
d. Production Directorate: responsibility to produce aircraft structure and aircraft
e. Technology and Development Directorate: has responsibility for design process and technology development

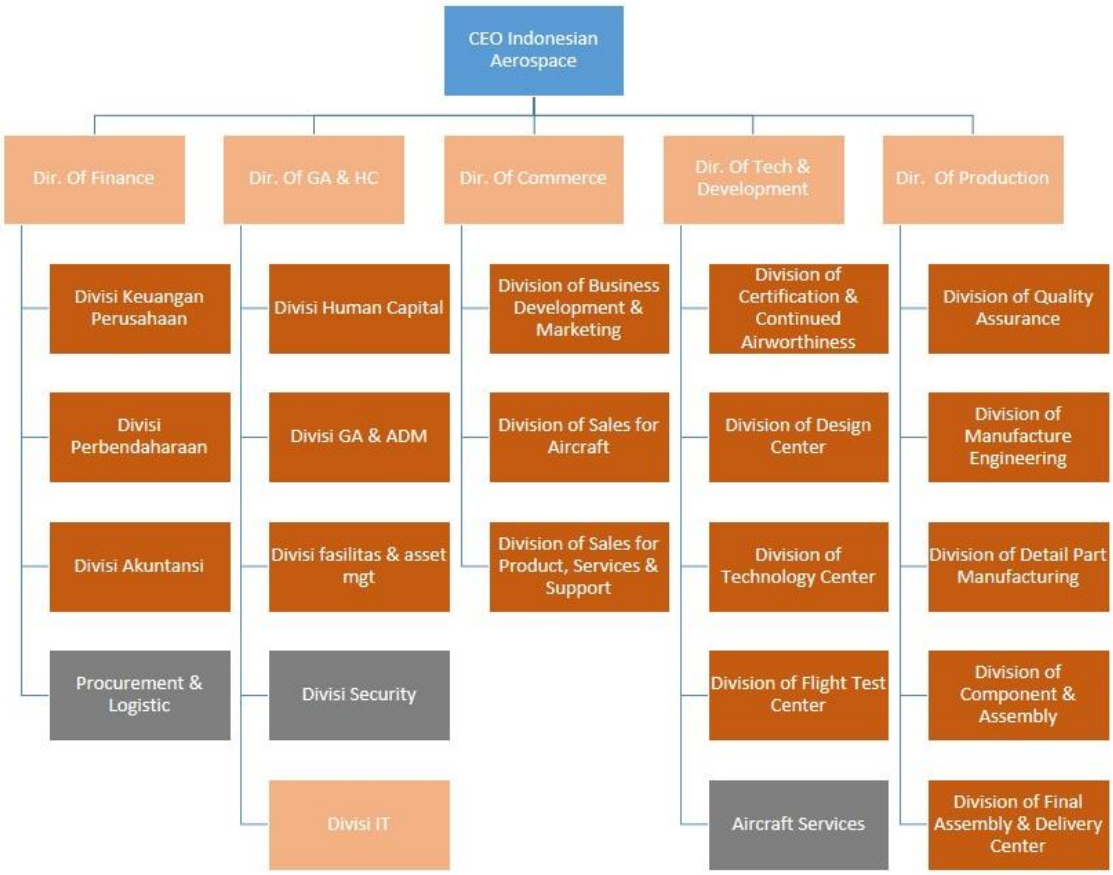

Figure 1.1. PTDI organization chart.

1.5 Scope of Business

PTDI's business scope is engaged in aircraft manufacturing, aerostructure, aircraft & engine services and Technology and Development. Each scope business is supported by a different directorate but remains integrated with each other. Figure 1.2 below are PTDI business scope and product results that have been delivered to the customer until 2017 is describe in figure 1.3.

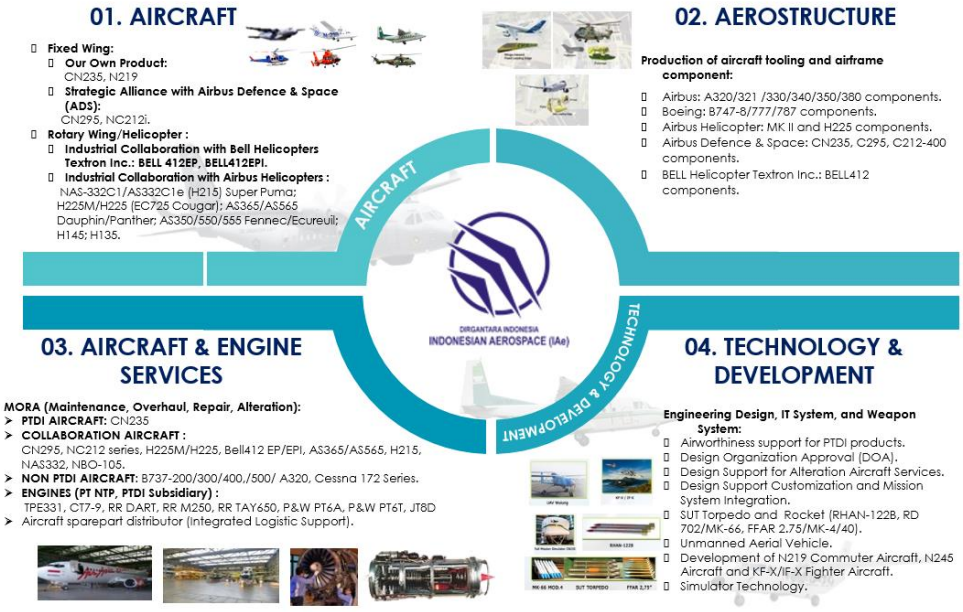

Figure 1.2. The scope of business PTDI.

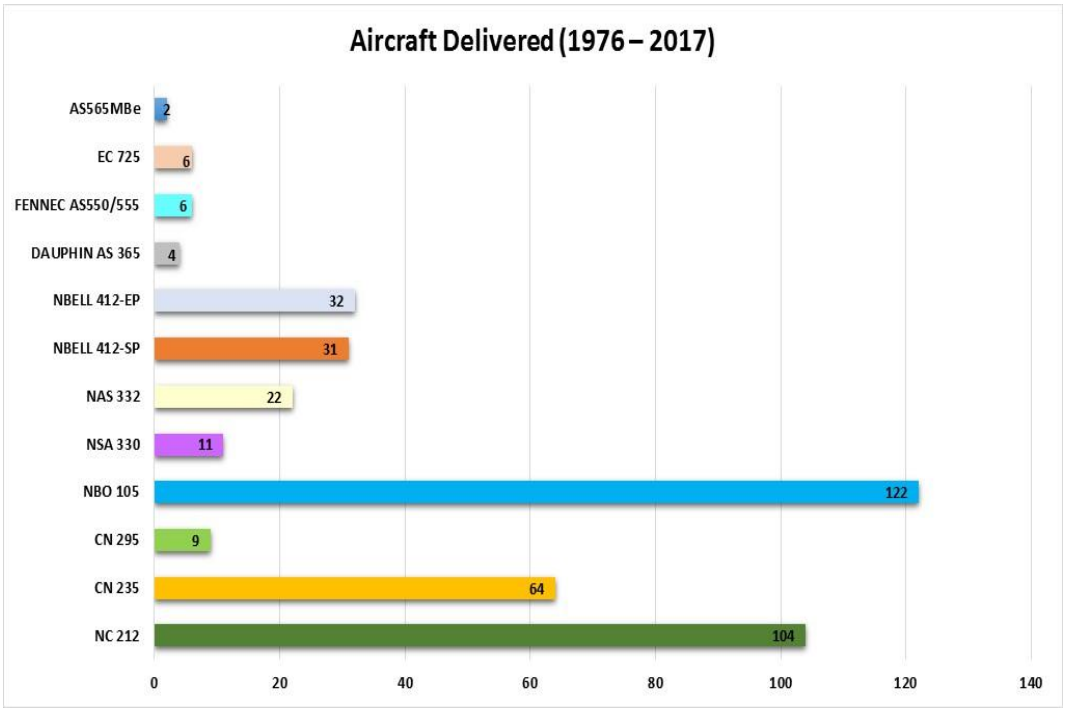

Figure 1.3 Aircraft Delivered (Commercial Directorate PTDI until 2017).

As we know, PTDI have delivered more than 200 aircraft for fix wing and rotary wing until 2017. It shows that PTDI have the capability to design and manufacturing aircraft.

1.6 Business Issue

1.6.1 N219 Development

After experiencing financial crisis and several cases in court back in 2003, PTDI underwent human capital exodus and had not recruit new talent for almost ten years. During that time PTDI experienced much loss of knowledge and decline in good corporate culture. These went on until 2012, wherein that year PTDI was almost declared bankrupt by the Jakarta district court. Luckily, PTDI was saved through the road of restructuring.

During this phase of restructuring, PTDI carried out some business transformation like the improvement of investment infrastructure in human capital and pursuing development of new product. At the same time, government trust is increasing; it is marked by the addition of orders into the PTDI. The Indonesian government also invests in PTDI through PMN funds (State investment). This PMN fund was used for Human Resource competency improvement program and improvement of production facilities, such as machine replacement and SAP implementation. In addition to continuing the development of new products, PTDI is collaborating with LAPAN (the national aviation and space agency) to co-develop a new aircraft product N219 since 2014.

The development of N219 aircraft is one of PTDI's strategy to increase revenue and increase market share. PTDI requires new products with relatively low development costs and more straightforward configuration to enable fast production times. In addition, N219 is also treated as means to transfer knowledge to junior engineers as well as a restatement of the company presence as aircraft industry. The success of the new program would increase customer confidence that PTDI still has the ability to design, build, and fly aircrafts.

1.6.2 *Market N219*

In a previous time, PTDI mainly serves the needs for military market and special mission aircraft, e.g. rainmaker. However, it did not help PTDI create the expected profit. This type of product line resulted in highly customised products and production processes, with a small number of aircrafts on each

batch. It took a long time to deliver, and with careless assumption and planning, this situation prone to delay. It would bite more into the already small profit margin for selling an aircraft.

With that background in mind, it is common sense for PTDI to start entering the commercial aircraft market segmentation. Based on the results of interviews with Mr Krisnan, PTDI's head of marketing division on the results of the market study, growth of commercial aircraft market is more significant compared with the military aircraft.

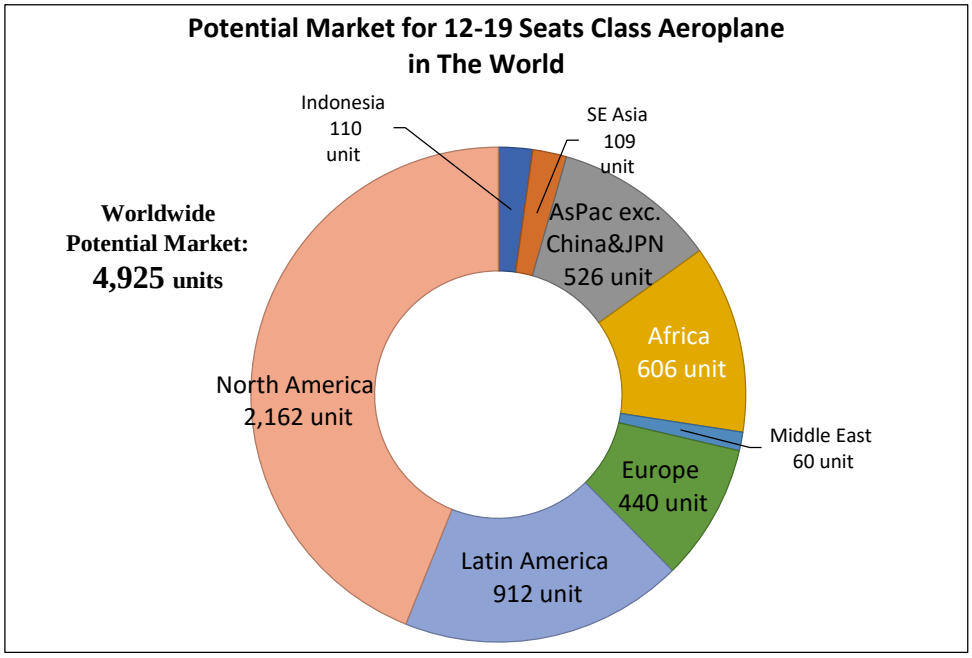

Figure 1.4 World Market Potential for N219 Class (*Data from Fleet Analyzer, analysis by PTDI, April 2017).*

Market demand value for an aircraft in 15-19 seat class for ten years ahead is taken from an aircraft that will be aged in each region with replacement percentage that varied in each region, which also affected by fleet growth, also in each region. Market growth projection estimation for N219 class aircraft given in figure 2.4 above. Asia Pacific Region shows the highest potential for marketing and sales of the N219 type of class in Asia region. Outside Asia region, Africa has the high potential market which is 606 aircraft. In America, the market size of Latin America is large with 912 units of the aircraft. Latin America can be as the market target of PTDI given the

presence of interest shown by the countries in Latin America against the product N219.

For the upcoming ten years from now, PTDI must reach the goal to market the N219 until the sales reach 110 units. Indonesia has the largest market share percentage which is 60% because Indonesia is the home-base of the N219 manufacturer. The following figure shows the potential market share of N219 for low scenarios around the world.

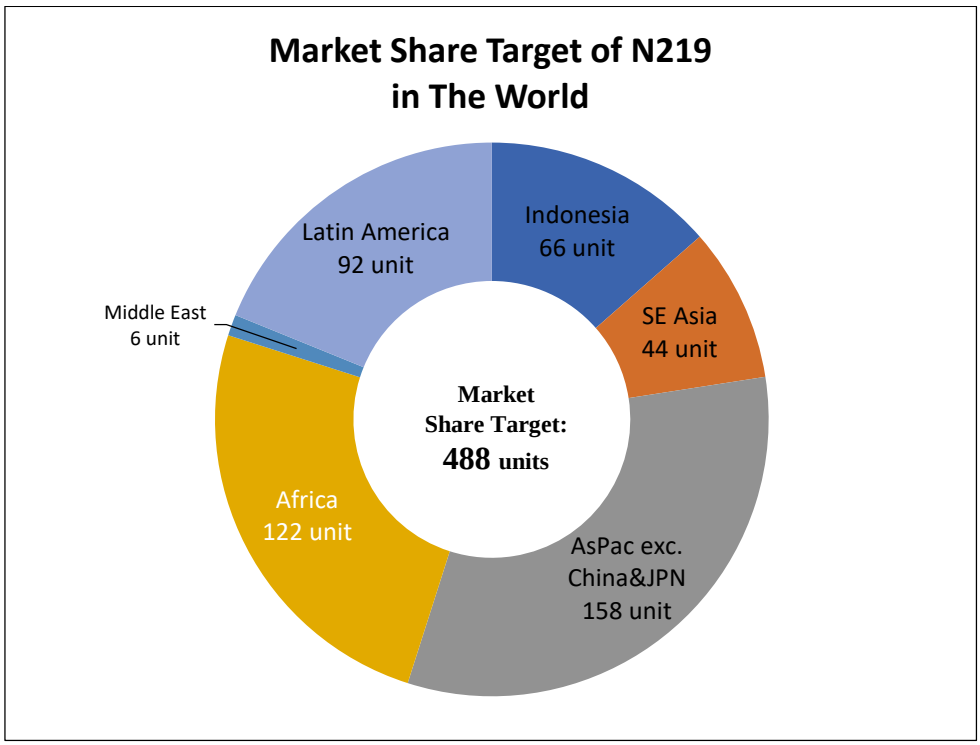

Figure 1.5 Potential Market Share for N219 Class (*Data from Fleet Analyzer, analysis by PTDI, April 2017)*

N219 intended to fill the needs for an aircraft in pioneer flight in high-density short routes and to and from airport/airstrip with limited infrastructure.

N219 is designed for the category of CASR 23 commuter aircraft with a capacity of 19 passengers. Therefore, the N219 is suitable to operate in remote areas to open accessibility and increase connectivity between medium to small cities and small towns to small towns. This type of aircraft is very fitting to connect many remote areas in the mountains as well as in other extreme conditions. The N219 can land on a short runway with minimum airport facilities. Thus, N219 is expected to answer the needs of small aircraft for Latin America and for eastern Indonesia.

1.6.2.1 Competitor N219

Unfortunately, in this niche of the market, PTDI is not the only player. Several competitors have first offer aircraft of similar class, some even similarly new with better performance: China's COMAC ltd. with the Y12, Czech's LET with their L410, and US's Viking with the famous Twin Otter (previously manufactured by Canada's DE Havilland). Unlike N219, all these aircrafts were already certified, and only Y12 that has not entered Indonesian market, yet. The price tag for the N219 estimated to be USD 5-6 Million, lower than the other aircraft yet on the same range with LET's.

Therefore, PTDI should pay attention to the momentum in launching its products to the market according to applicable regulations. Further delay in the program will cost the company in potential revenue loses.

1.6.2.2 Target Delivery N219

According to the company's long-term plan, the target delivery of N219 aircraft in 2019 to 2020 reach six units per year. Then after having experience in producing the series, PTDI would ramp up the production line to 8-12 aircraft per year.

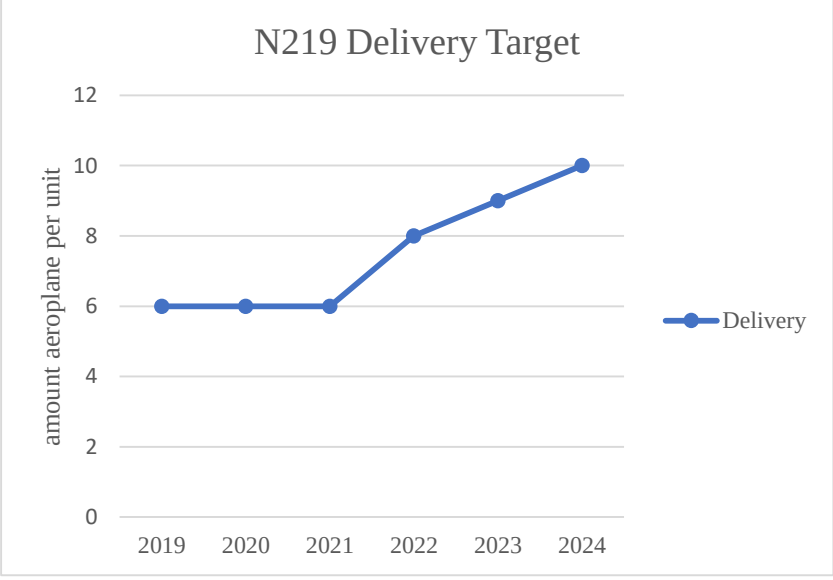

Figure 1.6. N219 Aircraft Delivery Target (PTDI Long term plan document 2017-2023).

Timely delivery of the product becomes one of PTDI's key success factors in improving the company's performance. By sending the product on time, PTDI

will be able to avoid penalty charges for the delay. In 2015, PTDI experienced a phase of decreased efficiency shown in the graph of the penalty amount to be paid from the profits of the company. In 2016 PTDI experienced a decrease in penalty fees but that was not due to the increased efficiency of PTDI, but rather due to reduced annual sales.

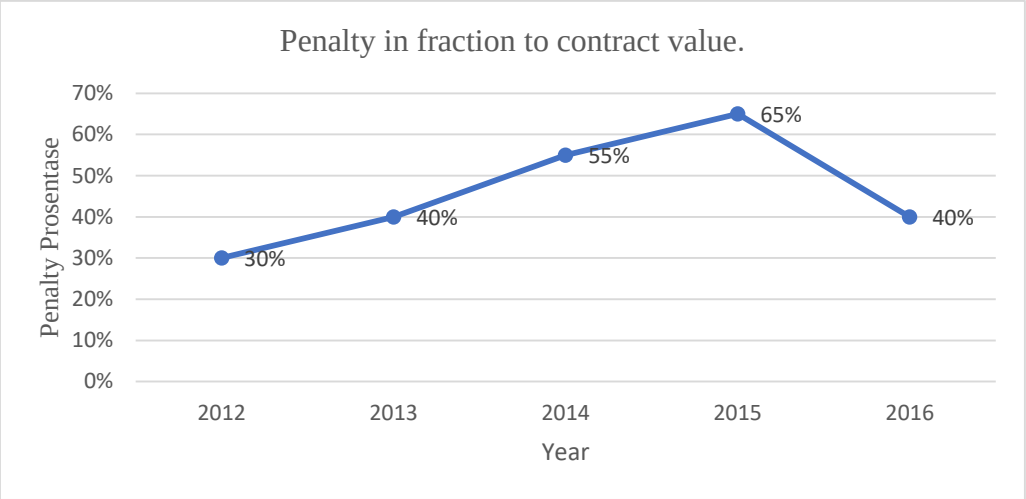

Figure 1.7. Penalty in fraction to contract Value.

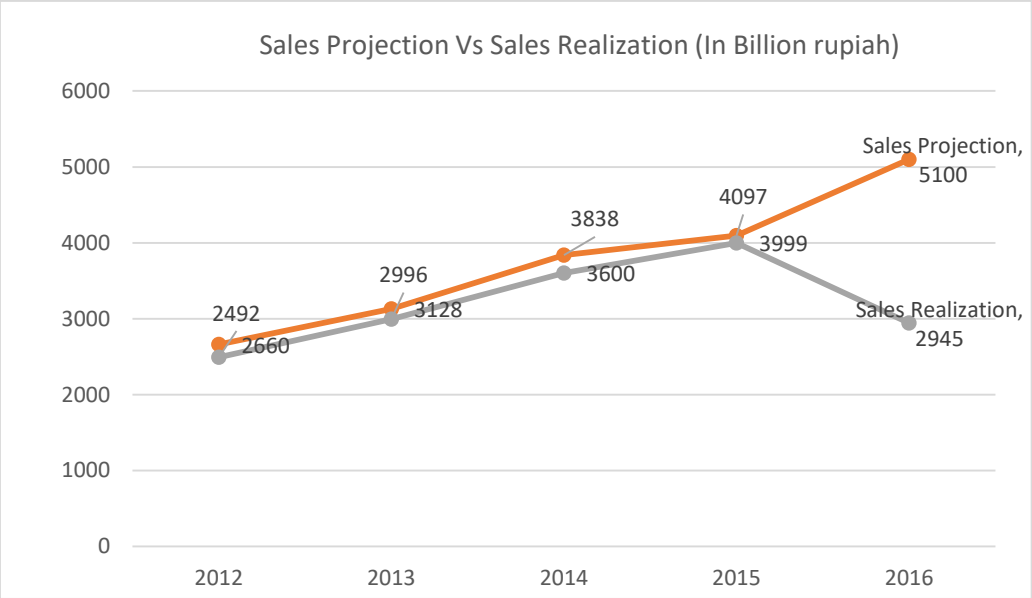

Figure 1.8. Sales projection vs realisation.

Based on long-term and short-term plan, the N219 aircraft is expected to boost sales and generate profits compared with other PTDI products. Thus, to achieve these targets N219 needs to learn from previous experience to be able to achieve the production target scheduled in 2019. However, before any

aircraft could be delivered, first, N219 has yet to obtain a type design certificate and airworthiness certificate.

1.6.3 N219 Existing Condition

To obtain certification for the N219, PTDI must be able to convince Indonesian safety authorities (DGCA) that the aircraft and design are safe to operate. Authority performs verification, conformity check, and ensure the aircraft is comply to appropriate safety regulation. The term conformity refers to whether a part manufactured is in accordance with the design. The term compliance answers the question of whether the design meets the regulations (Civil Aviation Safety Regulation, CASR) and design requirements.

In certification effort, the Authority required PTDI to shows proper documentation such as production drawing, system description, and test result analysis. In realising it all, it takes sufficient capital, capable workforce, the availability of raw materials, certified mechanics and, lots of time. As part of the certification process, a series of tests either on ground or in flight is required. One of the milestones is first flight.

According to the project timeline, N219 suffered a first flight delay from the original plan. The N219 prototype was planned to have its first flight back in 2015. But it does not become a reality until August of 2017. Based on the interview with Mr Palmana Banandhi, Chief Engineer of N219 program, one of the causes of the delayed process in realising this certification is limited workforce capability. It turns out it requires a longer learning time than expected.

1.6.3.1 Generation Gap

Currently, PTDI is experiencing a generation gap which reduces company's capability compared to those working on the N250 program. Failure of the N250 program caused most of its qualified talents left the company. Those talents are some out of 8,000 employees being laid off by PTDI as part of its restructuration attempt. Along with it, PTDI also suffered a loss of knowledge, Good knowledge in the form of procedures, know how to solve problems and some employee competency data documents.

During the crisis period, 1998-2003 PTDI also experienced financial difficulties which caused PTDI not able to recruit employees for more than 10 years in the optimal amount. The impact that is generated to date is that there is a vast gap between employees aged> 55 years and <55 years, see Figure 1.9.

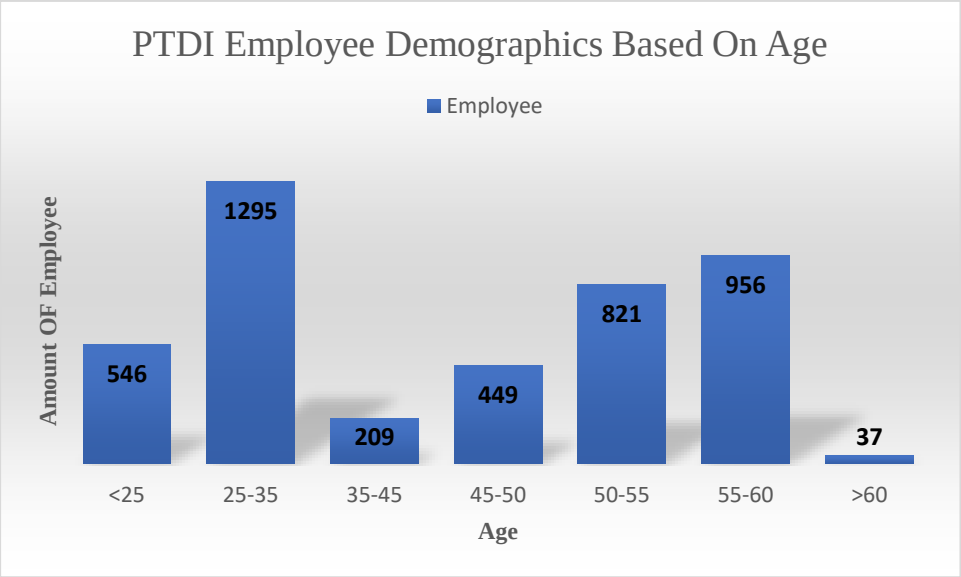

Figure 1.9. Employee demographics, based on age.

Brain drain phenomenon becomes one of the causes of the slow transfer of knowledge process and improvement of organizational capability. The consequences of this problem are the decrease of competence which resulted in the delayed process of product preservation and the decrease of company performance. One of the impacts of this slow transfer of knowledge is the increased realisation of overtime costs of total overtime costs budgeted compared to previous years.

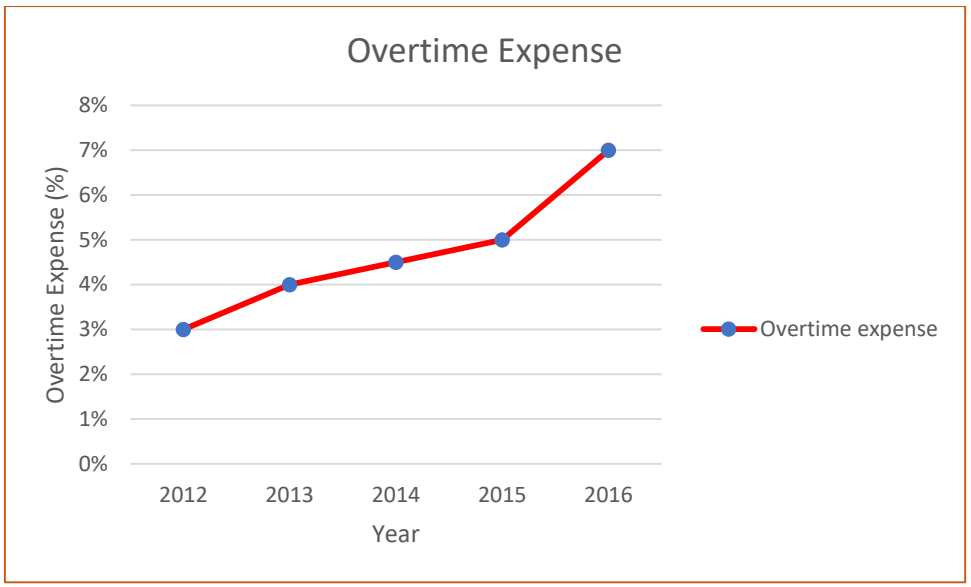

Figure 1.10. Overtime expenses from 2012 to 2016 (ref: performance record PTDI).

Currently, PTDI has been trying to fulfil workforce needs by doing recruitment. It is seen that in the picture the age of employees under 35 years almost dominates from the total number of employees. However, the capability of these young employees is not yet sufficiently qualified to execute the problems that arise during the testing of the aircraft. Because commonly it took about 5-10 years of experience. Although PTDI has overcome these problems through regeneration program by extending the service life of skilled employees in their field, it has not been able to meet the company's performance targets, including one indicator is the completion of the project N219.

The same perspective is also corroborated by the results of the KPKU BUMN assessment in 2016 that PTDI requires a Knowledge Management program to help accelerate the expansion of PTDI capabilities. The following are the results of the BUMN KPKU assessment:

1. *PT DI does not yet have a **method to manage Knowledge Management** as a manager of knowledge assets that can be used and studied by Employees so that PT DI will find it challenging to enrich organizational knowledge to support a sustainable company*.
2. Although PTDI already has a method of collecting and transferring employee/labour knowledge through knowledge sharing and transfer knowledge programs, but **the method is not systematic**, it is proven that

PTDI does not show an indicator of output size to the effectiveness of Knowledge Management program, because the new PTDI shows the input size in the form knowledge sharing and transfer knowledge programs, so it will make it difficult for PTDI to achieve the core value of Organizational Learning and Agility to enrich the company's knowledge.

3. *PTDI **does not yet have a method of transferring relevant knowledge from and to customers, suppliers, partners and collaborators**. There are no guidelines and mechanisms established in conducting such activities, e.g. **guidelines governing knowledge assets management, knowledge asset management programs Company as well as measures of knowledge asset management**. With this condition will make it difficult for PTDI to enrich organizational knowledge to support the sustainability of the company (Sustainability Growth) in the future*
4. *Although PTDI has used the knowledge and resources it possesses and attaches the learning in how to operate through training and learning programs to improve employees' knowledge in conducting PTDI operations in accordance with Skep/9/P/BD/XI/2015; it has not been proven effective. The realization and effectiveness of the training program experienced poor performance, down to 41.3%. It will make it difficult for PTDI to increase the competence of its employee.*
5. *Although PT DI in the development and learning system ensures the transfer of knowledge from displaced or retired workers by way of retired workers transferring their knowledge to other Workforce (75-KP-007) especially to new labour for regeneration process or regeneration, **the implementation is inconsistent**. T**ransfer of knowledge occurs only in operation, while the non-operation has not been made knowledge transfer program.** This potentially costs PTDI valuable knowledge along with its workforce in the non-operation department.*
6. *While PT DI ensures increased knowledge and new skills in the workplace by conducting training in accordance with the company's plans and needs, its **implementation has not been effective** yet. Evidently, there has been **no measurement and evaluation of the results of the training, such as the evaluation report on the results of labour training.** Thus PT DI will have difficulties in ensuring the occurrence of increased knowledge and new skills in the work of all workers who have attended the training.*

After passing the first flight phase, PTDI is expected to meet the timeliness of certification process to be produced in series in 2019. So PTDI also does

not lose momentum in entering time to market which will increase sales opportunity.

Based on the business issue, Finishing N219 program is one important factor in improving sustainability of PTDI. Finishing N219 program needed set of resources from tangible assets and intangible assets. Because N219 is a wide project that required various disciplines of knowledge and technical competence, adequate knowledge management, and required cooperation from various parties. All these capabilities are the capabilities that an organization must have to achieve its business objectives. N219 should be first flight in 2015, but the realization occurred in 2017. So that to reach time to market in 2019, then in 2018, N219 should finish its certification process. Certification will ensure that the aircraft is feasible to operating by customer. In this case PTDI must know the current position of organizational capability and which is expected achieve to target of finishing N219 program certification. Figure 1.11 explain about problem tree analysis why program N219 need organizational capability assessment.

Figure 1.11. Problem tree diagram.

1.7 Study Objective

Based on the business situation currently happening at PTDI especially in N219 Programme along with the designed conceptual framework in Chapter II, this study has following objectives:

1. To identify organizational capability expected to support certification of N219 in Technology and Development Directorate
2. To measure organizational capability gap in certification process N219 Aircraft at 2018
3. To Propose how roles and strategy of knowledge management can support certification process N219 Aircraft at 2018

1.8 Study Scope

This study focused on identification of organizational capability level based on the contextual problem that is faced by the N219 program certification. The rating to identified gap level capability is compared from capability in current condition with capability expected. The knowledge gap could then be rectified with KM strategy based on situational appraisal, literature, and best practice.

1.9 Unit of Analysis

Based on the business issue that has been presented, this study would not be limited to the realization of the N219 Program at the Directorate of Technology and Development.

THIS PAGE INTENTIONALLY LEFT BLANK