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Consulting Report – Servicios Industriales de la Marina (SIMA-Perú SA)

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Dedication

I dedicate this master thesis, first and foremost, to God Almighty and His Mother, Virgin Mary, Your blessings and guidance have helped me make it this far. Thank you for making the impossible possible.

I also dedicate my effort to my beloved parents, Eliana Cárdenas Quintana and Carlos Salas Valverde, who have been a source of encouragement and inspiration to me throughout my life. A very special thank you for the countless ways in which, throughout my life, you have actively supported me in my determination to find and realize my potential.



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Abstract

The objective of the present consulting report involves the identification of problems within SIMA-Perú SA and the assessment of potential solutions, this company is state-owned and has operations related to the ship and metalworking industries. There are three operation centers located in Callao, Chimbote, and Iquitos. This study is developed for the Callao branch.

A thorough analysis of the external and internal factors that affect the company was performed, this allowed the identification of the issues that the organization is currently facing. The problem that is developed in this project is regarding the insufficient capacity of SIMA-Perú SA to receive more and larger vessels like the Panamax or Post-Panamax ships. The current industry trends show that the dimensions of the cargo ships are increasing in order to have a higher efficiency in the transportation operations.

The following solution alternatives were proposed and evaluated: (a) update old equipment and adopt advanced technology, (b) build a new dry dock, and (c) invest in market research. After an assessment of the alternative solutions, the selected one was to build a new dry dock because it directly tackles the root causes of the problem and has a positive and sustainable impact for Peru. For implementing this solution, it is necessary to receive funding from the government, for this purpose, it is important to analyze the impact of this project for the country. This study is focused in the qualitative aspects of the project, further quantitative research is required.

Prior to the construction of the dry dock, SIMA-Perú SA must quantify the potential social impact of the project and obtain market data in order to prepare a deep and objective feasibility study. The proposed solution highlights the synergies between the Government and the organization objectives. It will help it reach its objectives for improving the economic and social status of the nation as well as increase the business activity for the company.

Resumen Ejecutivo

El objetivo del presente informe de consultoría consiste en la identificación de problemas dentro de SIMA-Perú S.A. y la evaluación de posibles soluciones, esta es una empresa estatal que tiene operaciones en la industria naval y metalmecánica. Cuenta con tres centros de operaciones en el Callao, Chimbote e Iquitos, este estudio se desarrolla para la sede de Callao.

Se realizó un análisis exhaustivo de los factores externos e internos que afectan a la empresa, esto permitió la identificación de los problemas que la organización enfrenta actualmente. El problema que se desarrolla en este proyecto es con respecto a la insuficiente capacidad de SIMA-Perú S.A. para recibir más y más grandes embarcaciones como los buques Panamax o Post-Panamax. Las tendencias de la industria muestran que el tamaño de los buques de carga está aumentando para mejorar la eficiencia de operaciones de transporte.

Las siguientes alternativas de solución fueron propuestas y evaluadas: (a) actualizar equipo antiguo y adoptar tecnología avanzada, (b) construir un nuevo dique seco, e (c) invertir en investigación de mercado. Luego de un análisis de las opciones de solución, la seleccionada es la construcción de un nuevo dique seco porque impacta directamente las causas raíz del problema, y tiene un impacto positivo y sostenible para el Perú. Para implementar esta solución, es necesario recibir fondos del gobierno, para este fin, es importante analizar el impacto de este proyecto para el país. Este estudio se centra en aspecto cualitativos, es necesario realizar una posterior investigación cuantitativa.

Antes de iniciar la construcción, SIMA-Perú SA tiene que cuantificar el impacto social potencial del proyecto y obtener información de mercado para preparar un estudio de viabilidad profundo y objetivo. La solución destaca las sinergias entre los objetivos del Gobierno y la empresa. Con esto alcanzará sus objetivos de mejorar la situación económica y social de la nación, así como incrementar la actividad empresarial de la compañía.

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Chapter I: General Situation of the Organization

In this chapter, the general situation of SIMA-Perú SA is described. Along with a company profile, the characteristics of the operations, the business units, and the organizational structure of the company are explained in order to obtain a basic understanding of the organization that would allow the development of further analysis. A thorough assessment of the external and internal factors that affect the company was developed with the objective of obtaining a clear panorama about the challenges that the organization faces.

The analysis begins with the evaluation of the industry environment where the driving forces, current situation, and development trends are described followed by an assessment of the competitive aspects. This helps to understand the industry in which SIMA-Perú SA develops its activities. Then, the external context is analyzed in order to identify how these factors affect SIMA-Perú SA's operations. This research involved the evaluation of the political, economic, social, technological, environmental, and legal factors that influence the organization. The frameworks that were used for developing this part of the analysis were Porter's Five Forces and the PESTEL methodology. The external analysis concludes with the identification of the opportunities and threats that SIMA-Perú SA faces and potentially could take advantage of.

For evaluating the internal situation, the tool that was used was the AMOFHIT analysis, through this, the following areas of the company were assessed: (a) administration, (b) marketing, (c) operations, (d) finance, (e) human resources, (f) information systems, and (g) technology. The internal analysis led to the identification of the strengths and weaknesses that SIMA-Perú SA possesses. The purpose of the external and internal analysis was to critically evaluate the context within which SIMA-Perú SA operates and gain insight with regard to the organization future operations.

1.1. Presentation of the Organization

SIMA-Perú SA is a government owned company but it is regulated like a private enterprise. It follows the policies of the Ministry of Defense, the General Command of the Navy, and the National Fund for Financing State Business Activity (FONAFE). The company has three operation centers strategically located in Callao which is the largest port and commercial hub of Peru, Chimbote which is the major fishing port and is located north of Lima, and Iquitos which is the most important fluvial port in the Amazon River (SIMA Perú, 2015).

All three branches have the necessary facilities to fulfill clients' requirements of services and goods, these include construction areas, repair docks, piers, parking, and workshops. SIMA-Perú SA currently employs more than 2,000 technical and administrative staff and considers its human resources to be its most important asset. They believe that their people are the reason they are one of the leading companies in the ship industry which is iconic for the country of Peru (SIMA Perú, 2015).

Founded in 1950, SIMA-Perú SA continued the development of the activities of the former Naval Factory of Bellavista. After some years, the company decided to expand its operational capacity for shipbuilding and manufacturing large metal structures (Marina de Guerra del Perú, 2016). SIMA-Perú SA is in charge of the maintenance services, and construction of ships and submarines for the Peruvian Navy. The company also services other government and private clients for projects related to the maritime industry and metal mechanics (Corporación FONAFE, 2007).

To ensure the effectiveness of its operation, SIMA-Perú SA has made efforts to implement an integrated management system based in the three most important norms: (a) ISO 9001 (quality), (b) OHSAS 18001 (health and safety), and (c) ISO 14001 (environmental protection). It has also implemented the Business Alliance for Secure Commerce certification

and the company follows the respective technical norms for each of the products that they manufacture.

1.1.1. Business units

By the end of 2015, the company had already built more than a thousand vessels including large ships, warships, fishing ships, seagoing tugs, and river boats. The metalworking business unit sold hundreds of metal structures including pedestrian bridges, and railway and port structures. SIMA-Perú SA operates under four main business units: shipbuilding, ship repair and maintenance, metalworking, and weapons and electronics. (SIMA Perú, 2015).

- **Shipbuilding:** For more than fifty years, shipbuilding has been an integral part of SIMA-Perú SA. The construction of ships is extended to vessels of different types and sizes such as, fishing boats, naval units, fluvial boats and personnel carrier motorboats. The company has built units for the Panama Canal Authority and other international and local clients. This business is not as profitable as others because of the prices of the materials and intense international price competition especially from China.
- **Ship repair:** Ship repair includes maintenance and engineering services for vessels; it is the core business unit of SIMA-Perú SA. The exact repair services are: hull fairing, sandblasting, propulsion, steering and system repair, maintenance of diesel, and boiler making works (SIMA Perú, 2015).
- **Metalworking:** With 30 years of experience, SIMA-Perú SA is considered to be an expert in the metalworking industry. The metalworking business is divided into four units: steel bridges, gates, pressure pipes, and other structures. The company is involved in the construction of infrastructure, specifically bridges, across the country (SIMA Perú, 2015). As it is a state-owned company, the government mandates and

funds these projects. SIMA-Perú SA does not gain any profit from these projects, however because its priority is to serve the government sometimes this results in fines for late delivery on their other projects.

- **Weapons and Electronics:** SIMA-Perú SA's activities have been extended to the weapons and electronics design industry. Using the company's microelectronics design center, radars, sonars, and automated control systems are created. They are currently the only sales representative in Peru for this industry.

1.1.2. Mission

The mission statement of a company addresses what the purpose of the organization is. It helps to create a unified perspective for company activities, all directed to the achievement of the vision.

SIMA-Perú SA's mission is to carry out the maintenance, modernization, design and construction of the units of the Peruvian Navy. In addition, the company takes on projects related to the marine industry and metalworking for the state and private sectors (SIMA Perú, 2015). They follow the highest standards of quality in order to contribute to the national defense and the socio-economic and technological development of Peru.

1.1.3. Vision

The vision statement of an organization provides a description of its desired future. It states what the company wants to accomplish in the long-term, this statement is also used for defining an approach in decision-making.

SIMA-Perú SA's vision is to be recognized as the best naval shipyard in Latin America, being the pride of the Peruvian industry (SIMA Perú, 2015).

1.1.4. Structure

As stated previously, SIMA-Perú SA is a state-owned company that gives priority service to the country of Peru, specifically the naval forces. Even though the company is

owned by the government, it holds private administrative, economic, and financial autonomy. It is regulated by the National Fund for Financing State Business Activity (FONAFE), this regulation occurs by the report of annual profits to FONAFE, and by approving the activities in which the company can invest. SIMA-Perú SA controls independently each of the three operations center, but has some departments that work across all branches, the organization structure is shown in Figure 1.

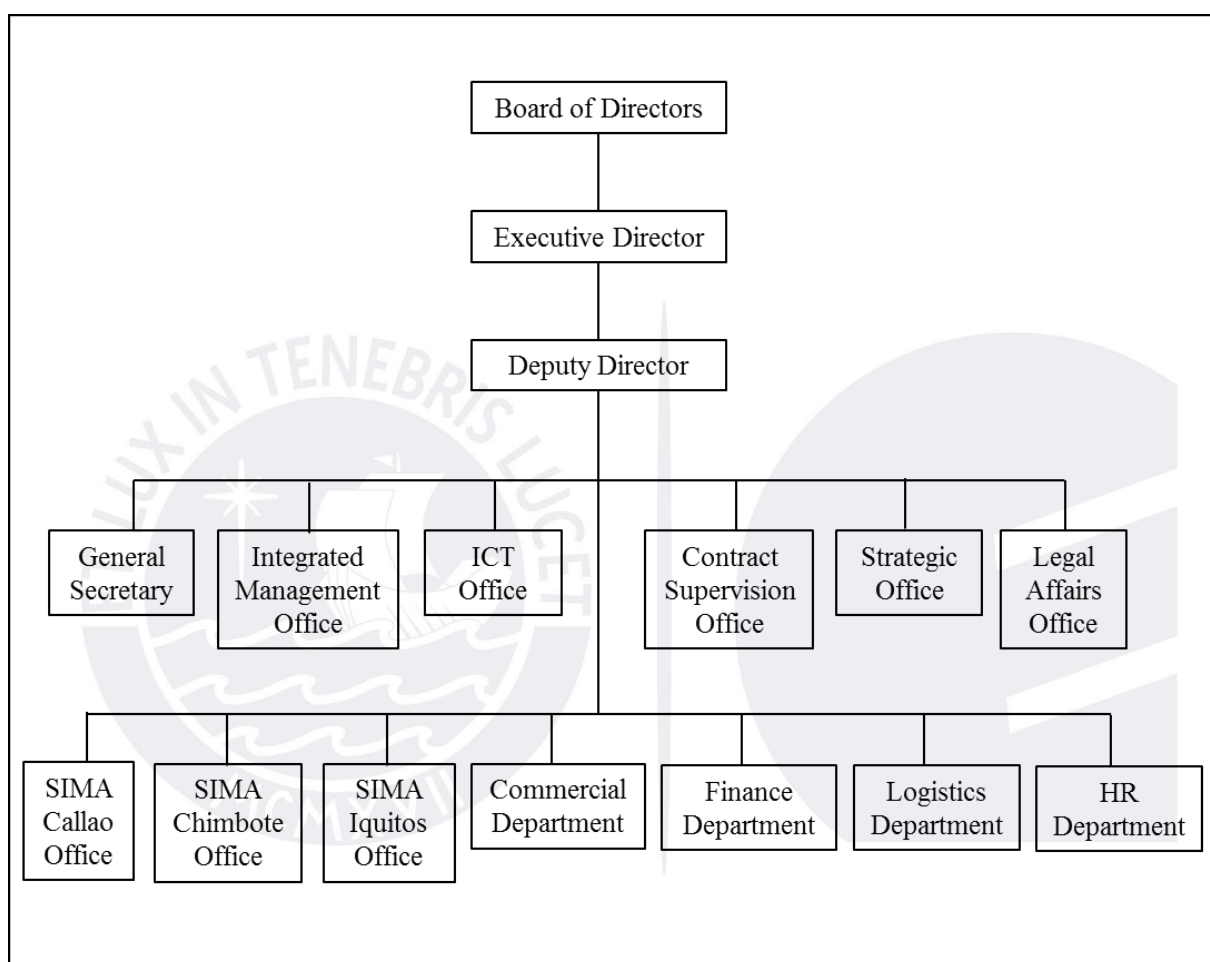


Figure 1. Organization chart of SIMA-Perú SA.

Adapted from “Manual de Gestión,” SIMA Perú, 2012

(http://www.sima.com.pe/transparencia/mapafonafesp/230_SimaPeru_Sem_2013_MOF.pdf)

1.2. Industry Analysis

1.2.1. Driving forces

Over the past centuries, ships have been constantly evolving in terms of design, engineering and size. These advancements are the result of improvements in available

materials and technology, skillful technicians and managers, and the globalization process which have boosted the international trade of goods that use ships as their main mean of transport.

The development of technology is the main force behind the new era of shipbuilding. There have been several technological advancements in this industry, for instance, there are the Global Marine Distress Signaling System (GMDSS) and Electronic Chart Display Information Systems (ECDIS), which have made specific functions more reliable and effective. It is worth mentioning the now widely used Global Positioning Systems (GPS) which has aided in navigation, and the use of aviation-like black boxes has helped in accident investigation (Card & Spencer, 2004).

Forty years ago, shipbuilding was a very labor-intensive industry. The advent of robotics to move and cut steel plate, along with automated welding machines that produce welds faster and of higher quality than humans, has contributed positively to the efficiency, reliability and profitability of the shipping industry. Computational Fluid Dynamics (CFD) technology solves hydrodynamic equations for time-dependent, three-dimensional flow around ships' hulls. Numerical solutions, using some simplified assumptions, provide a good description of the physical phenomenon and constitute a practical tool for ship's hull form design. In addition, it is important to mention that computers have improved the construction planning and modeling of ships, and as a consequence, the efficiency of the shipbuilding industry (Card & Spencer, 2004).

Humans have been a main driver behind the evolution of the ship industry. In regards to shipbuilding, skillful scientists and technicians have done extensive research to create new design plans and conducted experiments to test new technology and made it available to the industry. Historically, their diligence and experiential knowledge has led to the creation of many useful tools, and advanced machinery and technology. In 2013, Geoje Shipyard started

to utilize robots and created the robotic system to carry out labor-intensive tasks. It facilitated efficiency and lowered labor cost. The automatic system enables Geoje Shipyard to achieve the highest dock turnover in the world (Lo, 2013). Technicians who are the key factor to create new technology for the industry, along with the knowledgeable managers have built a more sufficient and profitable industry.

Knowledgeable managers contribute their experience and wisdom to manage company operations. In addition to supervising the employees, managing information systems, and maintaining relationships with suppliers, customers and competitors, managers do market research, and are actively involved in formulating the strategic plan and executing its implementation. Managers are the main force who oversee all the different aspects of the operations and guide the companies towards becoming a part of the modern shipbuilding industry.

Globalization has been the main reason for the rapid development of the ship relevant industry. Originally, ships were built to cater to the needs of naval activities and immigration. Over the past half-century, shipbuilding and maintenance have expanded to different business areas because of market forces. As globalization continues to develop, more and more international trade and international immigration occur. These trends have led to the evolution of the shipbuilding industry to meet the demands of globalization (Corbett & Winebrake, 2008).

For instance, until the 1950s, crude oil was refined and transported to markets in a number of small tankers sized between 12,000 and 30,000 deadweight tonnages. As economies of scale emerged, it became more beneficial and efficient for oil companies to ship larger volumes of crude oil from distant locations. This ultimately led to the emergence and evolution of today's large oil tanker vessels with capacities of 200,000 deadweight tons (Corbett & Winebrake, 2008). Larger vessels allowed the per-unit cost of intercontinental

energy transportation to reduce. Trends in globalization continue to encourage increased import and export which directly affects the shipbuilding industry. In order to stay current with the globalization process and competitive among rivals, players in this industry have to change and evolve.

After the described research, it has been identified that the entire shipbuilding industry has been developed under the guidance of three driving forces: (a) technological advancement, (b) specialized and skilled workforce, and (c) globalization. These forces have generated changes in the development of the industry in different aspects. For instance, by using more automated processes in the production, using computer aided design for the construction of ships, or changing the design with the objective of reducing transportation costs due to the high intensity of international commerce.

1.2.2. Development of Panamax ships

Since the development of the first commercial Panamax vessels, the number of this type of ships on the sea has increased significantly. As a consequence, the dry docks for their maintenance and repair have grown in number. Panamax ships have been designed to carry the maximum number of goods across the Panama Canal, and their size is specific to the maximum dimensions allowed for passing through the canal and are determined by the Panama Canal Authority. A Panamax cargo ship can carry approximately 65,000 tons of goods (Maritime Connector, 2012).

As the global trade develops, the higher intensity of international commerce demands vessels that can carry greater weights in order to optimize the transportation cost and time efficiency. In 2009, the larger Post-Panamax vessels entered the market, and are considered to be an emerging trend for the international shipping industry (Maritime Connector, 2012). A comparison of the technical aspects of the Panamax and Post-Panamax ships is shown below in Table 1.

Table 1

Comparison of Dimensions between the Panamax and Post-Panamax Vessels

	Panamax	Post- Panamax
Length	294.13 m (965 ft.)	366 m (1,200 ft.)
Width	32.31 m (106 ft.)	49 m (160.7 ft.)
Draught	12.04 m (41.2 ft.)	15.2 m (49.9 ft.)
TEU ^a	5,000	13,000

Note. Adapted from “Panamax and New Panamax,” Maritime Connector, 2012. Copyright 2012 by Maritime Connector.

^aTEU is an abbreviation for Twenty Foot Equivalent Unit which is used to indicate the capacity of container ships.

1.2.3. Demand for Panamax dry dock

The demand for maintenance and repair services of ships of around 70,000 tons is up to 283 ships (SIMA Perú, 2010). Currently there are only two shipyards operating for servicing Panamax type ships on the South West Pacific Coast. One is Braswell, located in Panama, and the other one is Asmar, located at the southern end of Chile. Both of the two ports have limitations due to natural factors. Braswell is affected by the heat and rain in the summer, which prolongs the inactivity of ships-in-progress by interfering with the work of hull. Whereas Asmar is threatened by natural disasters. The shipyard was seriously damaged by the earthquake and tsunami in 2010 which impacted its operations. This led to Braswell’s port exceeding its capacity.

As the number of Panamax ships increases, so does the need for Panamax dry docks along the South Pacific Coast for receiving, maintenance and repair. With a lack of shipyards for Panamax vessels along the South West Pacific Coast and the looming threat of a serious natural disaster to the existent Panamax shipyards, the shipping market urgently calls for new-birth shipyards for Panamax units. This represents a great opportunity for the country of Peru and SIMA-Perú SA, specifically for the Callao operations center.

1.2.4. Opportunity for SIMA-Perú SA

The port of Callao is the most important port of Peru and it is located in a strategic place along the South Pacific Ocean line. There is an increased international trade which brings more traffic of cargo ships to the port. A significant portion of the goods produced in Bolivia and Argentina for international trade are carried over the Andes to be shipped to Panama via Callao, and then to their final destinations. In 2007, over 20.7 million metric tons of cargo passed through Callao, 16.4 million of which passed through the Callao terminal, including imports, exports, transshipments and cabotage (World Port Source, n.d.).

Currently the Callao operations center is restricted in its capacity to provide maintenance and repair services for large cargo ships like the Panamax and Post-Panamax vessels. Approximately 90% of the vessels arriving at Callao do not fit in the current dry dock which is too small (SIMA Perú, 2010). Vessels which carry tonnage over the capacity of the Callao branch of the company have to proceed to the Asmar port in Chile instead.

In the absence of a proper dry dock for passing-by Panamax ships between Panama and Chile and with an increasing number of Panamax vessels in the international shipping industry, Peru is in a key location to provide services to Panamax units. It is time for the company stakeholders to consider this opportunity to develop its maintenance and repair services by expanding the capacity of SIMA-Perú SA for being able to receive Panamax and Post-Panamax ships.

1.2.5. Porter's Five Forces

This framework was used to assess the structure of the industry and market where SIMA-Perú SA conducts its business. Porter (1979) states that competitors go beyond those companies that offer the same product, there are other participants in the industry ecosystem that may take a major role depending on the good or service. These players include competitors, customers, suppliers, potential entrants, and substitute products. Performing this

analysis helps to identify which player has higher power and why. A summary chart with the result of the assessment of Porter's Five Forces for SIMA-Perú SA is presented in Table 2.

Table 2

Magnitudes of Porter's Five Forces for SIMA-Perú SA

Force	Magnitude
Bargaining power of buyers	Medium
Bargaining power of suppliers	High
Threat of substitute products or services	Medium
Threat of new entrants	Low
Rivalry among competitors	Medium

- Bargaining power of buyers: This force is considered to be of a medium magnitude because there are not very many options to choose from in this industry, however buyers are able to rely on more affordable maintenance depending on the distance of the next port. United States Gypsum Corporation (USG) is currently the only buyer in the industry, however their power is offset by the small number of shipyards to buy from. USG purchases refurbished parts, in-progress ships, and materials from shipyards along the Panama Canal. As there are only few shipyards that can service USG, their buying power is decreased.
- Bargaining power of suppliers: It is considered a high force. Due to the technological requirements and investment needed to own machines used within this industry, there are a small number of suppliers. The machines, such as lift equipment, cranes, and maintenance tools are the supplies provided within this industry. Due to the small market size, suppliers hold the power in terms of price, service, and delivery. All Needs Solution (ANS) is a Peruvian company that offers global logistics services and

is the main supplier for SIMA, along with the TTS group which supplies ship lifts and related equipment. Though these companies are related to SIMA-Perú SA, industry trends follow the same supplier power.

- Threat of substitute products or services: This force has a medium magnitude. Substitution is not awarded a high force because there is not a substitute for maintenance. All active ships require maintenance in order to function. However, the substitution comes from the available locations and companies based on their location and specialization. For external clients, substitution is based on distance between the next available maintenance ports. The closest possible substitutes for maintenance and repair services are the ports in Chile, Ecuador and Panama. High costs of this industry provide incentive for innovation of other platforms. Specifically, for SIMA, their attention is focused on the Peruvian Navy. This is contract based so the threat of change is low.
- Threat of new entrants: It is considered a low force because extremely high costs and technical requirements create high barriers to entry. This industry as a whole is not profitable and does not attract more players. The cost of required equipment, real estate, and the initial investments are relatively high. Though relatively stable once acquired within the industry, the costs and compliances offset the stability. In order for a company to enter this industry, specifically in the Panama Canal, they must obtain acceptance from their national government, national supplier, and Panama Canal board. This low force will remain in the industry even if trends change.
- Rivalry among competitor: It is a medium force due to the fact that competitive rivalry is dependent upon the distance between ports and the specialization at each location. There are few shipyards that specialize in the maintenance of certain ships, such as Panamax and Post-Panamax ships, which minimizes competition, however

this is offset by the distance to each destination. The competitive advantage in this industry derives from ability to specialize and the location of the shipyard. The medium force is awarded because of the emphasis of the strategic location of the port of Callao, opposed to its direct competition

1.3. External Analysis

An external analysis was performed through which different aspects of the business environment in which to SIMA-Perú SA develops its operations were scanned and assessed. The evaluation of the external context is important and crucial for identifying the opportunities that the company can take advantage of, and the threats that may reduce its business. All of the existing factors can affect the organizational performance positively or negatively, so it is necessary that the company becomes aware of these factors.

The framework that was used for this part of the analysis is the PESTEL, it focuses on the assessment of certain external aspects that have direct or indirect impact on the company activities. Through the analysis of 6 different factors, a better understanding of the external environment will be obtained. The most recent information available was used for developing this analysis.

1.3.1. Political factors (P)

Due to the efforts of the former president, Ollanta Humala, to decrease corruption and bribery, Peru has gained the chance to grow economically a bit more each year. In 2011 the country signed an agreement with the European Union allowing them to invest more in Peru and open the market to more economic activity. Duties of the free trade agreement are estimated to be around 500 million Euro (Market Research Reports, 2012).

More trade agreements with the United States, China, Australia, and Canada exist, aimed at reducing barriers to trade and foreign investment. Political stability in Peru is undermined by continued tremendous social divisions (Taft-Morales, 2013). Relating to the

shipping industry, the government has reduced the budget allocated to the defense sector which ultimately limits the need for maintenance and repair of naval ships. It is worth mentioning that the current president Pedro Pablo Kuczynski has a good approval rating of 63% in September 2016 (“Aprobación Presidencial,” 2016)

It is important to mention that the direction that SIMA-Perú SA follows depends on the government and the policies of the Ministry of Defense. As previously mentioned, efforts have been made by the state to reduce corruption, but still there might be conflicts of interest regarding the decisions and investments of the company (Barzola, Bomble, Esquen & Koenig, 2013).

1.3.2. Economic factors (E)

In order to spur economic growth, the government invested 10 billion USD until 2010. This investment successfully stimulated the economy with an average annual growth rate of 5.75%, the largest growth rate reported in Latin America in the last decade. Although the economy experienced a drop in growth during the financial crisis, it bounced back the following year to levels around 9% (Market Research Reports, 2012).

The Peruvian economy is characterized by low levels of interest rates, inflation, and devaluation. The free trade agreements that Peru has established with an abundance of countries (China, European Union, Canada, Japan, Singapore, Mexico, etc.) generate immense profits from exports. In 2013, the president stated that economic growth should be negatively correlated to the social disparity problem in Peru (Taft-Morales, 2013). The greater the economic growth, the less social problems there should be.

However, with regard to the shipbuilding industry, the state does not actively encourage it. Due to the fact that the shipbuilding industry is related with the international trade, when the 2008 financial crisis occurred, the levels of commerce decreased and had a direct impact on the industry, taking some shipyards to a bankruptcy situation.

1.3.3. Social factors (S)

Social factors are arguably the most challenging environmental components in Peru. The government has managed to succeed in fighting some of the social issues, such as the national poverty rate which has decreased from 54.3% in 2001 to 25.8% in 2012 (Market Research Reports, 2012). This change reflects the economic changes towards a free market. Poverty should continue to decrease with the government's economic drive and focus on infrastructure projects to reach all socially disadvantaged people in Peru.

Reducing social conflicts was on the agenda, of former president Humala, over the last few years. However, it is difficult to strive for a balance between helping poor and indigenous people and encouraging investments in the business sector (Taft-Morales, 2013). New processes to benefit indigenous people might, for example, add bureaucracy and hinder business projects. This tension between indigenous people and companies has created a problem for the government. For instance, some ministers have proposed to exclude indigenous groups in decision making processes for projects in order to speed up the process.

There remains a huge income gap between the top 20% of the population, who earn more than half of the nation's income, and the lowest 20% who earn barely 4%. The country's poorest 20% has an infant mortality rate that is four times as high, and almost half of the children are malnourished. Social development programs have been funded with 1.1 billion USD and are aimed to help closing the gap between the rich and the poor in Peru (Market Research Reports, 2012). The wages offered in private companies tend to be higher than the ones in state owned companies.

According to the Economic Intelligence Unit, the trade surplus which has been accumulating over the years, cannot be fully utilized due to a lack of Peruvian institutions. The government is faced with the challenge of how to become more effective and capitalize on the previous years' positive performance (Taft-Morales, 2013).

1.3.4. Technological factors (T)

Many highways, ports, airports, and railroads exist to manage the increased traffic in Peru that has resulted from economic development. However, many parts of the country are very hard to reach and some are inaccessible. A better network of electricity is needed to support the country's large mining industry. In 2010, approximately 35% of the population was using the internet (Market Research Reports, 2012). The number of big providers for internet and television and mobile phones are becoming increasingly available and continue to penetrate the market. The government has placed duties on the biggest provider, Movistar, in order to encourage its reach to rural areas.

Regarding the shipbuilding industry, technology is posing a problem since many foreign competitors have highly standardized and automated processes which drive down the cost and become more attractive based on price. There are different technologies that can be useful to the shipbuilding industry like the 3D printing which can produce intricate shapes needed for the production of vessels or robotic manufacturing which can perform dangerous and very detailed work such as welding. As mentioned before, an example of this automated processes in the shipbuilding industry can be found in the shipyard Geoje (Lo, 2013). The volatility of the price of steel is also creating an obstacle to increasing industrial production, although the tendency these last years has been to decrease (Evans-Pritchard, 2015).

1.3.5. Environmental factors (E)

Companies from the mining, energy, and logging industry have to consult with indigenous and rural communities before starting any project involving natural resources inside the areas of inhabitation. Protecting the environment is a new challenge for the government as it has not been a top priority for a long time. For example, the mining industry is very old, however the ministry in charge of protecting the environment from the effects of mining is less than 20 years old.

During his time in office, former president Humala declared that the Amazon jungle in Peru is in a state of emergency (Taft-Morales, 2013). Oil spills have negatively impacted the river, forest, animals, and the inhabitants in the region. In one of Ollanta Humala's environmental initiatives he fought with an Argentinean oil company to clean up a mess that they had caused in the past and done nothing about. The company agreed to clean up the mess, however, blame the environmental damage on the previous land owner. There have been several violent protests in the past in regards to the mining industry. In 2012, five protesters were shot down by the police. In 2013, there were more violent protests where the police and activists clashed over protecting water reservoirs.

The shipping industry is also being impacted by the eco-friendly trend which is followed by several industries. There are systems that reduce fuel consumption in ships, reduce the noise produced by the engines, and capture renewable energy. All these technologies aimed to reduce the environmental damage that the shipping industry can produce are communicated by BIMCO, which is the world's largest international shipping association, in a document titled *The Guide to Maritime Environmental and Efficiency Management* (BIMCO, 2014).

1.3.6. Legal factors (L)

There is a law which impacts directly SIMA-Perú SA which is law 27073 that was created in March 1999, this one is titled *Ley de Servicios Industriales de la Marina SA*, it regulates the activities of the company according to the Ministry of Defense policies and states that the main purpose of the organization is to serve the Peruvian Navy. Attention to private sector customers is only with the objective to generate profits to maintain the company, this limits greatly the business activities of the company (Barzola, et al., 2013).

The government of Peru created the National Fund for Financing State Business Activity (Fondo Nacional de Financiamiento de la Actividad Empresarial del Estado -

FONAFE) in order to have an organized management and control of the government's business activities in the country. This institution is in charge of setting and overseeing the regulations and controls that the state owned enterprises (SOEs) have to follow such as good corporate governance (Reverditto, 2012).

There are 32 principles involved that include best practices for the SOEs. FONAFE is responsible for approving the annual budget including possible investment proposals. All Peruvian SOEs are required to lay out a five-year strategic plan that outlines the strategy and objectives of the company. These objectives have to be aligned with the Strategic Corporate Plan approved by FONAFE (World Bank, 2014). In Figure 2, the general strategic objectives of FONAFE can be seen in more detail.

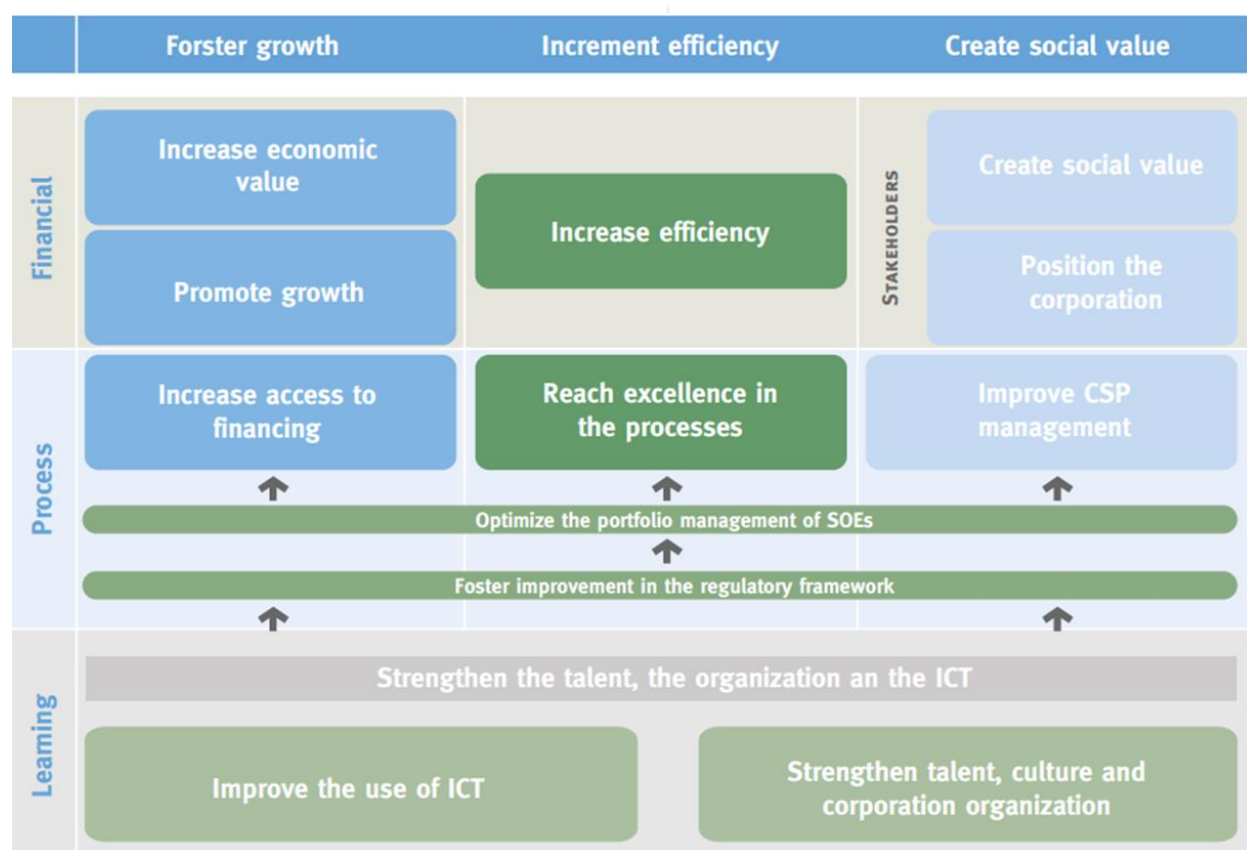


Figure 2. General strategic objectives of FONAFE

Reprinted from "Corporate governance of state-owned enterprises in Latin America," World Bank, 2014

(<http://documents.worldbank.org/curated/en/634451468088457556/pdf/894680WP00P1260o-rate0Governance0LAC.pdf>)

1.3.7. Conclusions of the external analysis

Through the analysis of the external factors that impact the company's operations, the opportunities and threats that the organization faces were identified. Table 3 presents an arrangement of these opportunities and threats that were determined for the company. SIMA-Perú SA should seek taking advantage of the opportunities the current context is offering, and look for ways to reduce the potential negative impact that the threats would have.

Table 3

Opportunities and Threats for SIMA-Perú SA

Opportunities	Threats
<ol style="list-style-type: none"> 1. Low levels of interest rates, low inflation and devaluation. 2. Signature of Free Trade Agreements with the United States. Likely signing of Free Trade Agreements with China, European Union, Canada, Japan, Singapore, Mexico, etc. generate an increase in national exports. 3. A stable business environment in the country with good perspective. 4. Technological advancements towards an increased productivity and a reduced environmental impact 	<ol style="list-style-type: none"> 1. Company activities depend on the government in turn. 2. Decreased construction and mega projects of public and private, domestic and foreign investment. 3. High level of automation of our foreign competitors in shipbuilding. 4. High volatility of prices of steel which is the main material for shipbuilding. 5. Construction of new dams in competing shipyards limiting and improvement of installed capacity in national shipyards. 6. Private sector wages are more attractive, people leave for better paying jobs. 7. The priority for the company is to service the Peruvian Navy, leaving private sector clients behind.

1.4. Internal Analysis

In this section, the internal factors of the company are analyzed for obtaining a better understanding of the forces that influence the normal operations of SIMA-Perú SA. Through this evaluation, a thorough knowledge of the organization will allow the further identification

of strengths and weaknesses. The framework used for this analysis is the AMOFHIT methodology, this approach consists in assessing the different departments of the company. By focusing on one area at a time, a deeper evaluation of the factors affecting each department of the company is performed.

1.4.1. Administration (A)

The company is state-owned, this means that the government has full control of the organization and constantly audits it. The president or the prime minister does not have direct influence in the organization. Rather, the government is represented by another state-owned company called FONAFE, who supervise and regulate most of the companies that are state-owned. All of the requirements and major decisions of SIMA-Perú SA have to be evaluated by FONAFE.

The organizational structure is vertical. This generates issues for having fluent communication between all levels. For instance, workers cannot talk directly to managers because levels of position are so highly differentiated. An important aspect in the organization is that not all of the procedures are standardized. This has a significant impact over the control of the projects because they are assessed differently by each area resulting in a divided control of the initiatives that each area presents. Bureaucracy is another characteristic of this organization. SIMA-Perú SA does not have the capacity to quickly respond to change because there are so many procedures and processes to follow for each task. The nature of its business has almost no influence on this characteristic, rather it is largely because the company belongs to the government.

1.4.2. Marketing (M)

SIMA-Perú SA aims to serve all of the customer's requirements. However, they have issues trying to find the right balance between their efforts for giving high quality service and the price that they charge because in some cases the costs tend to be as high as the price,

resulting in little to no profit. This is partly due to a lack of market research. SIMA-Perú SA does not have a deep knowledge of their competitors, so they cannot well define their comparative and competitive advantages.

As presented previously, the company has a wide range of products in different business units, but not all of them have the same level of profitability. According to SIMA-Perú SA the maintenance unit has the potential to have the biggest impact on the economic performance of the company. It is important to note that the profit generated from government projects is negligible. This must be taken into consideration because the government is one of SIMA-Perú SA largest clients. SIMA-Perú SA (2008) stated that from satisfaction surveys, it has been determined that 84% of their clients are satisfied with the services of the company. They are working on establishing good relationships with clients so they can be retained, but the management of these relationships is manual and not systematic.

1.4.3. Operations (O)

As it has been mentioned, SIMA-Perú SA possesses several business units and each of these has a different production process. There is an intensive use of machinery and specialized tools across the operations of the company including cranes, welding, and painting equipment. The machinery that is currently used needs to be updated to optimize efficiency. The outdated machinery also contributes to increased costs for SIMA-Perú SA due to unforeseeable breakdowns which result in dead times and higher costs to repair the equipment. There is also a lack of policies for supporting investment in research and development. This creates an environment that is not open to innovation and suggestions for company processes in order to optimize operations.

The locations of SIMA-Perú SA are also very important for the organization, having presence in the most important port of Peru (Callao), the largest fishing port in the country (Chimbote), and in the Amazon River (Iquitos), positions the company as a strategic partner

for its clients and the government. The installed capacity of these operation centers was adequate, but the market has changed and is demanding services to ships that the company currently cannot give, it is necessary that SIMA-Perú SA looks at increasing the capacity of its facilities, especially for receiving larger vessels like the Panamax or Post-Panamax ships in order to increase its business.

1.4.4. Finances (F)

Historically, SIMA-Perú SA has had a stable financial performance. The company has been able to afford its resources with its own revenues, so no financial aid from the government has been needed. The current operations of the organization do not allow big profits because its main clients are the Peruvian Navy and the government, for them the price has to be equivalent to the cost of the projects. Profits come from the business with private clients mainly for maintenance and repair services, and the shipbuilding of a diverse portfolio of vessels such as fishing ships or tugboats.

Another factor that affects the financial performance of the company are the exchange rate fluctuations because most of the material that they use is purchased in American dollars and also the prices they quote to their international clients are in foreign currencies. As a consequence of being supported by the government, SIMA-Perú SA has a good credit score so the banks are willing to work with the company and offer it lower interest rates for loans and other financial services.

1.4.5. Human resources (H)

For SIMA-Perú SA, its most important asset is its work force. The employees are very skilled and specialized in what they do, however the average age of its technical staff is around 55 years (SIMA Perú, 2008). This means that even though employees have the skills necessary for doing the work, they are not aware of the latest innovations in machinery and techniques. The company does offer training programs, however they are not well organized

nor effective. There are currently no established policies for managing talent development inside the company.

The high average age of the employees is an issue that needs to be addressed. In some years these persons will retire and new young people would be incorporated into the organization. These new recruits will have to go through a learning phase that could be shortened if there was less of a disparity between what they learned in trades school and the outdated processes and procedures, and machinery and equipment at SIMA-Perú SA. Another aspect that is relevant for this part of the analysis is that there are too many persons hired in the administrative areas. This means that not all of the human resources are being used at their maximum capacity and that employees are not being hired in departments which have the most impact for the company.

1.4.6. Information systems (I)

More than 75% of the software used in SIMA-Perú SA is from Microsoft and belongs to the Office package of applications (SIMA Perú, 2008). The company does not have an ERP software for its operations, they have another software that is considered obsolete because its functionalities do not match the requirements of the users. Although a solution for this problem has started to be implemented, the new software offers improved connectivity for some departments but still is not as versatile as an ERP.

The flow of information is not smooth, the business units cannot access their own accounting or human resources data in the moment. For instance, to access financial reports there is a procedure for requesting the report which needs to be approved by a supervisor. This makes the process of accessing information very inefficient.

1.4.7. Technology (T)

SIMA-Perú SA uses intensively technological equipment for its operations. One of its business units is in charge of the modernization of the units of the Peruvian Navy, for this

activity they need to manage the latest technologies in the naval industry for defense.

Employees are eager to learn about cutting edge technology in the industry but SIMA-Perú

SA is not investing much resources in this training. Another factor is that machinery is old.

The equipment used in the operations needs to be replaced, and an adequate training plan is needed to support the technological changes within the organization.

1.4.8. Conclusions of the internal analysis

An arrangement of the strengths and weaknesses that were determined through the evaluation of the internal factors for SIMA-Perú S.A is presented in table 4.

Table 4

Strengths and Weaknesses for SIMA-Perú SA

<i>Strengths</i>	<i>Weaknesses</i>
<ol style="list-style-type: none"> 1. Strategic geographic location. 2. Prestige gained through its 66 years of business. 3. Preferential rates in the financial market. 4. Installed capacity of existing infrastructure. 5. Quality of the product delivered, with ISO 9000, 14000, 18000 & BASC certified and experienced staff. 6. Portfolio of loyal customers that guarantee ongoing workload. Peruvian Navy and the main fishing industries. 7. Strategic Company for National Defense. 	<ol style="list-style-type: none"> 1. Vertical Organization with reduced room for maneuver of its executives; low level of communication between those responsible for each process. 2. Machinery and equipment old (outdated) and low productivity, which result in high operating costs and maintenance. 3. Scarce development in market research and a lack of business intelligence regarding global competition, and market studies. 4. Bureaucratic procedures and reports for the state. 5. Inadequate software production system. 6. Staff poorly trained and elderly. 7. Low level of profits in the maintenance and repair business unit. 8. No activity in the field of Research and Development. 9. The Callao operations center lacks the capacity to service ships of the Panamax type or larger vessels.

1.5. Conclusions

After performing an external and internal analysis, the factors that could advance the future operations of SIMA-Perú SA has been determined. These factors extend to the external threats that are present within the industry and the strengths that the company has to overcome these challenges.

1.5.1. Strengths

SIMA-Perú SA's primary internal strengths are location, reputation, international and national certifications, and good credit and financial connections. The port of Callao is located along the Pacific coast at the center of South America. The port is located south of the Rimac River, its anchorage is protected by large offshore island of San Lorenzo and by a long promontory and breakwaters.

The organization has a long-standing reputation for delivering quality products and services. SIMA-Perú SA holds National and International certifications including ISO 9001 (Quality Products), OHSAS 18001 (Health and Safety) and ISO 14001 (Environmental Protection). Being a state-owned company makes SIMA-Perú SA an attractive prospect for banks for loans and other financial services.

1.5.2. Weaknesses

At SIMA-Perú SA, there is currently no activity in the field of research and development, and market research, which has resulted in a lack of business intelligence regarding global competition and market studies. Although the organization does know that shipping traffic is increasing along the Pacific coast and there are currently not enough ports to service these large ships. The Callao operations center does not have the capacity to service ships of the Panamax type or larger vessels, and there are potential customers that cannot be received. There are months when the existing docks are not enough for the

demand, this creates a bottleneck that leads to increased waiting times and unhappy customers.

Communication within a vertical organization requires strong leadership, a clear organizational structure and clear processes. In the company, there is a low level of communication between those responsible for each process. Further, state-owned companies have lowered levels of authority and have to follow bureaucratic procedures and produce reports for the state. The State has a narrow view of SIMA-Perú SA, with regard to its potential, and does not recognize the opportunities and the social impact that could be achieved through aligning their objectives, creating a synergy.

1.5.3. Opportunities

Compared to other South American countries on the Pacific coast, Peru has a low inflation rate of 3.34%, which makes it attractive for investors (Trading Economics, 2016). In addition, the government is committed to keeping inflation rates low to see growth in Peru's economy. The signing of Free Trade Agreements with the United States, China, European Union, Canada, Japan, Singapore, Mexico, etc. generate an increase in national exports and increased traffic along the Pacific coast. This increase in international commerce presents an opportunity for SIMA-Perú SA to become a destination for Panamax type ship maintenance and repair.

1.5.4. Threats

SIMA-Perú SA's priority is to serve the Peruvian Navy, and sometimes this delays the work that they are doing for national and foreign ship owners. This incurs late penalties that SIMA-Perú SA is responsible to pay and has created a lack of fidelity with national and international clients. Although recently the more prevalent issue is that there is decreased construction and mega projects, of public and private, domestic and foreign investment. Competitors, particularly in Asia, have a high level of automation in shipbuilding. In

addition, the construction of new dams and improvement of installed capacity in competing shipyards threatens the opportunities for SIMA-Perú SA. In Peru, private sector wages are more attractive, resulting in high employee turnover and loss of skilled technicians, as people tend to leave for better paying jobs.



Chapter II: Key Problem

In this chapter, the problems that were found in SIMA-Perú SA are identified. After this, the main problem that is aimed to be solved in this project is further defined. The explanation of the main problem is in-depth and considers different perspectives in order to take a holistic approach.

The perspectives that are taken into account include the location, ownership, magnitude and time perspective. The location refers to in which departments the problem has been observed; ownership is related to the affected areas and the actors involved in solving the problem; magnitude regards to the importance of the issue; and time perspective is about the tendencies related to the problem.

2.1. Identified Problems

After the assessments of the internal and external factors that were performed in Chapter I, and visits to SIMA-Perú SA's facilities, the problems that the company is facing have been identified. These problems are extended throughout different departments of the organization including machinery, human capital, and processes.

- Vertical organization with reduced room for maneuver of its executives; low level of communication between those responsible for each process.
- Scarce development in market research and a lack of business intelligence regarding global competition and market studies.
- The Callao operations center lacks the capacity to service more and larger ships like the Panamax type.
- No activity in the field of research and development that puts the company behind the latest industry technologies.
- Staff are elderly and could be better trained. Technicians do not undergo continuous training to keep their skills current.

- The machinery and equipment is old and has low productivity rates, which result in high operating costs and maintenance.
- The naval base takes up a large area of land, not allowing room for SIMA to expand its capacity.
- Unable to market itself due to state restrictions, therefore unable to attract prospective clients.
- The government takes control of SIMA-Perú SA and does not provide support for its private activities.
- The company does not possess the technology and resources to expand the capacity by itself.
- Financial restriction from FONAFE because this entity must approve the annual budget and other strategic decisions.

2.2. Key Problem

In a meeting with SIMA-Perú SA's personnel, Carlos Novoa who is the head of the Strategic Office stated that it was of the most interest of the company to focus the consulting project in the problem that involves the lack of capacity of the company for servicing more and larger vessels in the Callao operations center, focusing in the potential impacts that solving this problem could have for the country.

2.2.1. Substance

SIMA-Perú SA is a state-owned company that caters to the Peruvian Navy and Government. The organization recognizes the strategic significance of the location of the port of Callao in the South Pacific Ocean, and the opportunities that the Peruvian Government is not taking advantage of.

The main problem is that the Callao branch of SIMA-Perú SA does not have the capacity to repair or give maintenance services to a good number of ships, especially those of

larger sizes, specifically the Panamax and Post-Panamax ships. This relates to two weaknesses that were previously identified in the internal analysis which are having outdated equipment and not having the infrastructure to receive larger ships. These weaknesses impact directly the business by limiting the operations of the company because larger vessels cannot be serviced in the dry dock that already exists.

Another aspect to consider is that the company does not possess enough resources for making big investments. In order for getting additional budget for increasing the installed capacity of the organization in the Callao operations center, certain stakeholders have to be convinced of the importance of this project for Peru. According to the company's head of Strategy Office, the decision makers in the budget allocation care most about the strategic and social impact of the project since having an updated shipyard is a matter of national interest. Ratios such as the return on investment or the payback period are not relevant for the stakeholders and are not a priority in the development of the solution.

Part of the task involves finding alternative solutions for improving the capabilities of the organization for increasing its business, and also to show the stakeholders the social and strategic benefits of expanding the capacity of the Callao branch of SIMA-Perú SA for Peru as a country. Thereby not focusing on the benefits for the company but rather the further reaching social impact of this investment for the country.

2.2.2. Location

The problem is within the maintenance and repair department. The capacity at this moment is not sufficient, affecting this department directly and others indirectly as well. The maintenance and repair department is working with old machinery and are not able to fulfill all client needs. Another important aspect to mention is related to the infrastructure, plants and buildings, is also outdated which also contributes in generating delays in the working procedures or not being able to service larger vessels.

Restricted capacity affects the whole business as the company is not attracting more clients or making notable profit. For example, even if the marketing department was more successful in attracting new clients, the capacity of the Callao operations center is too small and does not have the required infrastructure to handle the increased demand. Therefore, the problem is affecting many departments of SIMA-Perú SA directly and indirectly as it restricts the whole company from growing.

2.2.3. Ownership

As previously stated, the problem affects the organization as a whole because an opportunity is not being seized. The barrier to taking advantage of the opportunity (increased shipping traffic and larger vessels) is the limiting capacity of the Callao operations center. Since the problem is about the lack of capacity for receiving more and larger ships, it could be thought that the only area affected is the maintenance and repair business unit, but the issue should not be perceived in this manner.

For instance, the lack of capacity for receiving more vessels and Panamax type ships implies that there is a market opportunity that is not being taken advantage of. This aspect is the responsibility of the marketing department. Other areas such as human resources are also affected because technicians often sit idle as they are not always able to work on tasks because the Callao operations center cannot accommodate a large number of ships or ships of all sizes.

The company is aware of the problem and eager to find a solution, but there are different aspects to consider. In the case of seeking an expansion of the Callao operations center, the project would require a large investment that would need approval not only from the executive board of SIMA-Perú SA but from other stakeholders (like FONAFE) and in a further instance from the president of Peru. This problem integrates several actors inside and outside of the organization.

2.2.4. Magnitude

The magnitude of the lack of capacity within SIMA-Perú SA has an absolute effect on the business and community, and its affiliations. This lack of capacity is causing the company to reject clients, in turn generating less profit for the state-owned company. As the Peruvian Navy holds precedence over any other client, SIMA-Perú SA must turn away potential business when a Navy vessel needs attention. This extends to all business units, particularly maintenance and repair, and building.

The surrounding community is also affected by the lack of capacity because it is not able to gain the potential benefits. Higher ship traffic through the port has the potential to create increased activity in neighboring communities of Callao. Along with decreased activity for surrounding communities, the internal activity is not at its full potential. Employment, intelligence, and partnerships are immediately impacted by the capacity ability, or lack thereof. The magnitude of this problem is high and a possible solution will have a parallel impact.

2.2.5. Time perspective

There is no dry dock for Panamax type ships between Panama and Chile on the South Pacific Coast. Located at the center of the coastline, the company's Callao operation center aspires to launch a new era for its ship maintenance business by building dry docks for passing by Panamax ships. In order to build the Panamax dry dock, SIMA-Perú SA needs government support. If the required capacity is achieved the port will serve Panamax ships and bring benefits to Peru and SIMA-Perú SA for the considerable future.

The first Panamax ship was delivered in 1969 (Tirschwell, 2015), this type of vessels has been increasingly prevalent and evolving. Following the development of Panamax was the larger Post-Panamax model, and in 2009, the New Panamax, an even larger ship, came onto the market (Maritime Connector, 2012). A new dry dock for Panamax ships in the

Callao operations center would become a permanent part of its infrastructure and it will have to be maintained and updated to adapt to the future evolution of Panamax ships.



Chapter III: Literature Review

3.1. Literature Mapping

Through an intensive research, books and papers regarding the main topic of this report were reviewed. This quest will allow gaining a better understanding of the theory related to problem solving in companies and to operational capacity management. In addition, the ideas and concepts that were more relevant from the initial literature search were identified and researched in a deeper way.

The main idea for the literature review was set as problem solving in companies related to operational capacity management. Based on this statement, the literature mapping matrix was developed. The main topic is divided in two parts in order to have a clearer structure for the literature research, one part is problem solving in companies and the other one is operational capacity management. For each of these sections, the matrix displays the most important concepts that were identified. The literature mapping matrix is shown in Figure 3.

Regarding problem solving in organizations, most of the literature emphasizes the importance of performing a good problem definition considering different criteria depending on the type of organization and the current situation that it is facing. Another key concept is related to the causes identification, the authors describe different methodologies for doing an effective identification of the factors that are leading to the problem.

For operational capacity management, the most relevant concept is operations management which describes the activities that involves managing this aspect of a company. Capacity is also considered in this part of the literature review, authors describe how to design the capacity of a production system and how to plan the demand in order to guarantee and efficient use of the resources of the organization.

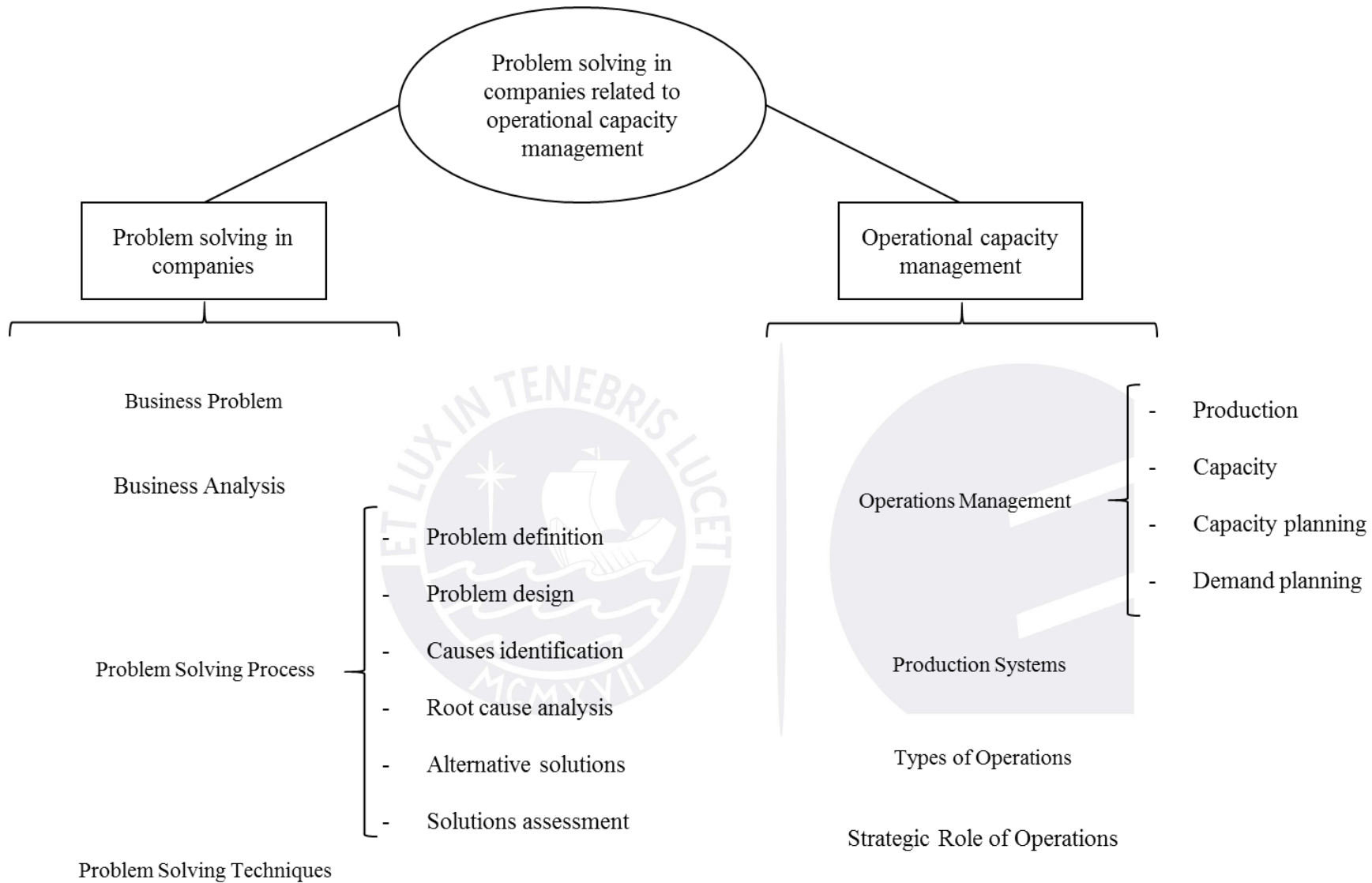


Figure 3. Literature mapping matrix for problem solving in companies related to operational capacity management

For both sections of the main statement, problem solving in companies and operational capacity management, additional literature mapping matrixes are developed. In these arrangements, the relevant concepts have been grouped with other related ones, in addition, the authors that support these ideas are shown.

Figure 4 shows the literature mapping matrix developed for the section of problem solving in companies, there are four main topics in this part which are the business problem concept, the analysis of companies, the problem solving process which shows all of its components and phases, and the problem solving techniques.

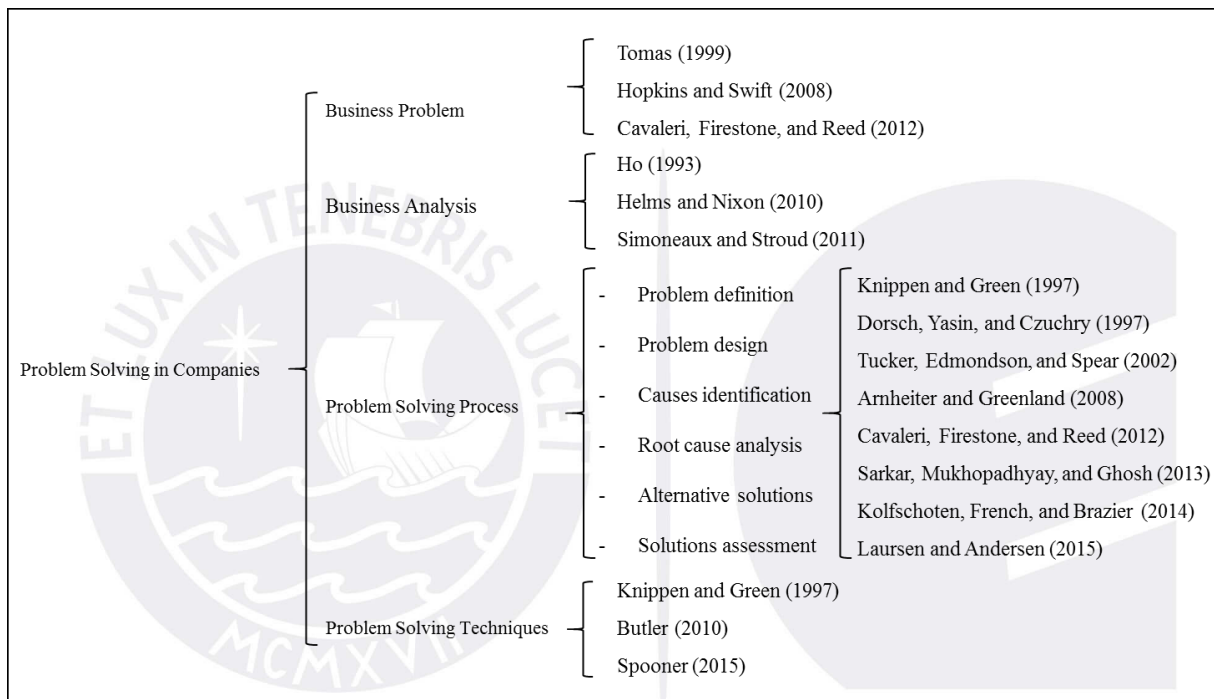


Figure 4. Literature mapping matrix for problem solving in companies

The literature mapping matrix for the section of operational capacity management is shown in Figure 5. Like the previous case, the different concepts have been grouped and explored in depth. Operations management includes the concepts related to production, capacity, capacity planning and demand planning. The production systems, types of operations and strategic role of operations ideas have also been explored. Each of the concepts will be developed in the following sections of this chapter.

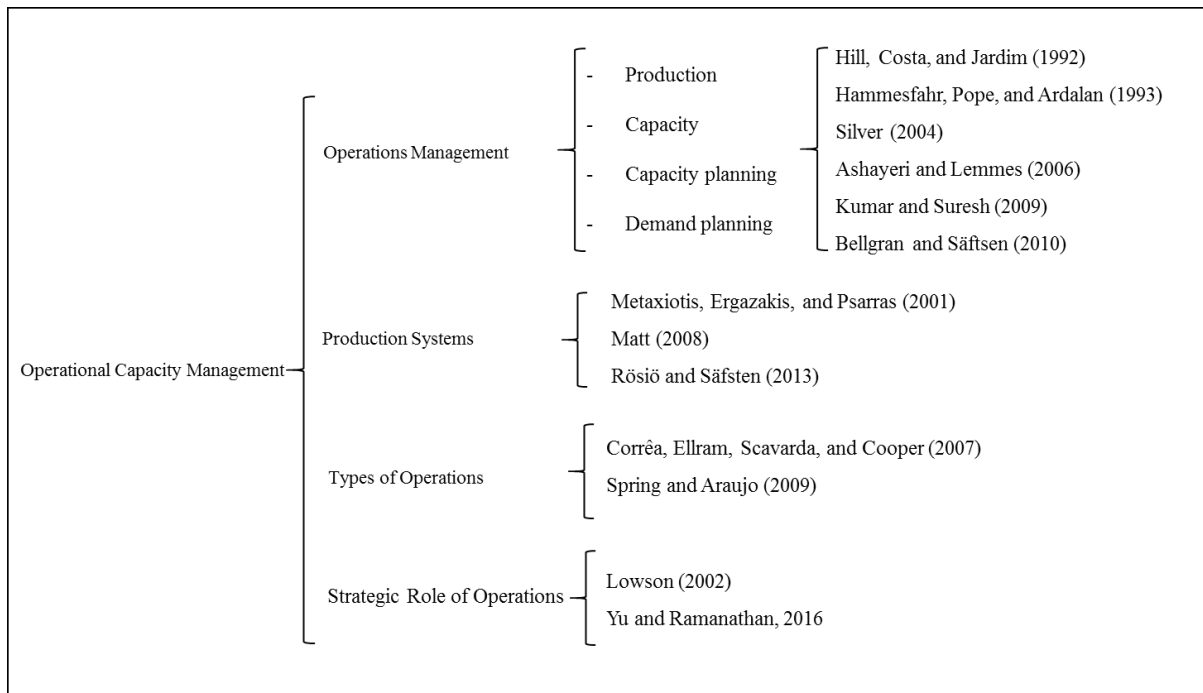


Figure 5. Literature mapping matrix for operational capacity management

3.2. Literature Review

3.2.1. Business problem

The definition of problem within the business context, as stated by Tomas (1999), is an undesirable circumstance or difficulty that is being faced by an organization, the main characteristic of this concept is that the circumstance cannot be solved right away because it involves a research and analysis in order to find a suitable solution for it. Cavaleri, Firestone, and Reed (2012) presented another definition for problem that can complement the one described before. It is that a problem is when a disruption is identified in the settled conditions in which a company develops its activities.

Hopkins and Swift (2008) conducted a research in order to identify the most frequent problems in companies, their study presents that one of these problems is related with the technologic advancements as these can affect the company if it does not adapt to the changes. The authors mentioned some examples like when personal computers replaced larger processors units or when gas lamps where replaced with the incandescent light bulb. This

shows that new technology can be used to improve the organization operations and become more efficient, or on the other hand, it can also put an end to the core business if it aims to replace the product or service offered by the company.

Problems can be perceived as positive by some industry players since a company dealing with a lot of issues can become a target for an acquisition at a low transfer price. For managers, the origin of most of the problems that a company faces comes from external factors like the suppliers negotiating new working conditions, competitors entering new segments or releasing new products, technological advancements, and the clients changing their habits and looking for new products. As it is important to conduct researches and analysis of all those factors that do not depend on the company, the organizations also need to make efforts in activities inside the company in order to have a fast reaction to the problems that can emerge (Hopkins & Swift, 2008).

3.2.2. Business analysis

Business analysis is a procedure that is regularly performed in a firm in order to obtain a better understanding of the external and internal environments, as a result of this process, problems can be identified. This analysis can also be done when a problem has already been perceived but it is necessary to gain knowledge of how the external forces impact the company activities and how the departments are affected inside the company. As described by Ho (1993), the process for solving a problem starts with the problem identification, then an analysis should be performed for finding causes that lead to the problem, and finally a decision must be taken for a solution.

The business analysis, apart from its role in problem solving, is used for the strategic planning of an organization. The result of performing this evaluation can be arranged in a SWOT matrix which considers the strengths, weaknesses, opportunities and threats for a company. For obtaining these components, the analysis can be divided in two parts, the first

one related to the external environment and the other one that considers aspects from inside the organization. The evaluation of the external factors considers all those who does not depend on the company but have a direct or indirect impact in the company operations. Helms and Nixon (2010) explained the necessity of using frameworks for performing the external analysis such as Porter's Five Forces which focus in the assessment of the competitive environment in which a company operates. The internal analysis is related to what happens inside the organization, specific departments need to be evaluated in order to identify the capabilities and weaknesses that the company possess.

According to Simoneaux and Stroud (2011), it is important to perform a regular analysis of the SWOT matrix in order to obtain a clear panorama of the business performance and to plan ahead if any potential problem is identified. These authors also state that the analysis of the business can also be performed in a limited aspect, for example in cases of a product launch or an acquisition. It is important to involve employees in the analysis in order to obtain insights that are only available to frontline employees.

3.2.3. Problem solving process

The problem solving process is a set of sequential steps, Knippen and Green (1997) affirmed that this process within a firm involves organizing a group of people for analyzing a specific ongoing circumstance that is not wanted by the company, identifying the real issue, finding alternative solutions for solving the problem, assessing each solution and its implications based on a set of criteria, and deciding for the one that would have the best impact for the organization.

O'Loughlin and McFadzean (1999) pointed out that the problem solving process can be biased by personal or group characteristics like the personality, past experiences, and motivations. The authors reported that some researches have shown that this happens especially in the collection of information and the conceptualization of the problem.

According to Lowy (2011), the amount of experience of the person in charge of solving the problem affects the process, for example senior managers may think that they know how everything works inside the company and that may lead to not noticing more effective solutions and other implications that are easy to see for someone that is new to the topics, it is important to have a diverse group for problem solving in terms of knowledge and experience. Although past experiences can influence the direction for solving a new problem, Tucker, Edmondson and Spear (2002) stated that companies should learn from previous problems that they have had in order to become more efficient and avoid recurrent mistakes.

The problem solving process can offer a positive effect, if the employees are involved in this process, the motivation of these would grow because they would feel that they are part of the solution of an important problem in the company. The workers would get a feeling of inclusion and would feel responsible for the success of the solution. This helps the implementation of the solution to be easier and to increase the productivity levels due to the higher satisfaction levels (Knippen & Green, 1997).

The problem solving process varies depending on the type of company. For instance, in small businesses, according to Perks (2010), there is not enough management expertise and their problem solving process is mostly based in past experiences and a hit or miss method. Giroux (2009) also explained that these companies make their decisions supported by intuition and a continuous learning, leaving behind rigid methodologies.

3.2.4. Problem solving techniques

For solving a problem, there is a wide variety of techniques that can be used, ones that are very structured and others that are more flexible in order to adapt to different types of problems. For instance, Spooner (2015) noted that the most used methodologies in the manufacturing sector are the DMAIC which stands for define, measure, analyze, improve and control, and the Eight Disciplines which are team organization, problem description,

containment plan development, root causes identification, corrective actions development, implementation, prevention and congratulations.

Knippen and Green (1997) described a more standard methodology that can be applied to any problem in a company. It starts with establishing goals, these objectives should be related to the mitigation of the problem symptoms and the solving of the problem. Then, the problem identification which is about analyzing the situation and identifying what is the undesirable circumstance that need to be changed. The next step is identifying the constraints of the organization, here is important to realize of any facto that would limit the proposed solutions like budget.

This is followed by the identification of alternatives, all the participants of the problem solving process should submit alternative solutions without performing any assessment. Harley (1996) stated that in this phase, there should not be critical judgement because all the team members should express their options, at this point there are not impossible solutions. Next, the evaluation of the alternative, the pros and cons of each possible solution should be addressed. After that, the selection of the best solution, in this phase the team members should take a vote based on the supporting arguments that were developed in the previous step. Finally, the creation of the implementation, here all the steps for a successful implementation must be taken into account including as much detail as possible.

The conventional technique that involves identifying a problem, analyzing information, generating alternatives, and making a final decision can be helpful with common problems but considering that the business environment is more competitive and dynamic, the basic frameworks do not offer a good scheme for the new complex situations. There is a need for new methodologies for identifying, defining, solving problems (Cavaleri, Firestone, & Reed, 2012).

Regarding alternative techniques for problem solving, Butler (2010) explained lateral thinking which consists in questioning basic assumptions in order to create a clear decision environment. This methodology looks for the participants to come up with creative alternative solutions which later are discussed using some logic criteria. Cunningham and Farquharson (1989) described another method called systems problem solving, this is about understanding the subsystems of an organizations, how these interact and how these are affected by the external and internal environments. An analysis of the interactions and compatibility of the systems is needed because that affect the overall performance of the company.

3.2.5. Problem definition

One of the steps of the problem solving process is the problem definition. According to Sam (1999), the problem definition is a key phase when solving a problem because it guides the following steps and the final action that the company would take. He states that the problem should be precise, clear, realistic, measurable and, most important, achievable for the organization.

Misselhorn (1978) emphasized the importance of including proof of the effects of the problem in its definition. Apart from the substance of the problem, the statement should include the contrast of the current situation and the wanted one, and also supporting evidence of the impact in the organizational performance trying to be as specific as possible including facts and figures.

Many people think that they will know the problem immediately and do not spend much time in performing a good problem definition. Knippen and Green (1997) affirmed that symptoms are easy to notice and it creates confusion because people take them as problem, they do not analyze what is causing them, this creates a lot of failures in problem solving because they jump into conclusions without a thorough analysis.

Tucker, Edmondson and Spear (2002) described that a problem occurs when there is a difference between an expected and ongoing situation, they mention that frontline employees are a good asset when it comes to problem solving because they are the ones that encounter the problems in their daily life so they can help in a faster problem identification. If the selected solution is not successfully implemented, the problem is still a problem. All the steps of the problem solving process must be fulfilled (Sam, 1999)

3.2.6. Problem design

Problem design is part of the problem identification phase, Laursen and Andersen (2015) stated that it is defining the structure and space of the problem. Roth & McGinn (1997) commented that it can be hard to design the problem because there is constant change. Ballard (2014) explained that some consultancy services companies frame the problem in a structured, hypothesis-driven framework.

Designing the problem involves not only the identification of the symptoms and the problem itself, it is about giving it a structure so the proposed solutions can solve the issue. In this part, the problem solving team must validate what constraints that the company has because the problem is an undesirable situation that should be achievable, so the problem has to be designed considering these constraints (Knippen & Green, 1997)

In a given situation, the problem can be phrased in different ways. The team must make sure that the problem statement can be solved by an action of the company and does not depend on external factors which are not controlled by the organization. The problem framing should be done by identifying and specifying what is needed so the attention is focused in specific aspects of the current state, it help for a better interpretation and articulation of the phases for problem solving (Laursen & Andersen, 2015).

According to Laursen and Andersen (2015), the problem framing is driven by four factors. Goal clarity is related to desired state awareness within the problem solving team,

path clarity refers to the awareness of the resources that the company has for overcoming the issue, mechanism is the methodology in which the problem is being solved, and obstacles are what is impeding to solve the problem.

3.2.7. Causes identification

This step allows the identification of all those factors that lead to the problem. Sarkar, Mukhopadhyay, and Ghosh (2013) described this phase as a process which is the reason why the problem exists. It is important to classify the causes in order to determine the root causes in order to take specific actions for those.

This identification should take the problem solving team to define courses of action, for guaranteeing an effective impact the causes should be controlled by an adequate department, they should be supported in numerical evidence, and the causes should be expressed in terms of a lack of something (Sarkar et al., 2013). Finlow-Bates, Visser, and Finlow-Bates (2000) stated that there are two type of causes, the first one is tangible causes which refers to problems with materials or machinery, and the second one is failed controls which regards to problems in inspections or prevention of problems.

Sarkar et al. (2013) explained some techniques for identifying causes for a problem like the Five Whys, the Tree Diagram, the Apollo Root Cause Analysis, and the most important one which is the Cause and Effect Diagram also known as Fishbone Diagram. This methodology is most used by companies because it does not only allow to establish causal relationships but also to classified the cause under categories like machine, material, man and method.

3.2.8. Root cause analysis

After the causes identification, it is mandatory to identify the root causes in order to be able to generate effective alternative solutions in the following step of the problem solving process. A root cause can be defined as the fundamental reason of a problem, if it gets

eliminate, the undesired situation would stop occurring. The root cause analysis is used for determining this basic cause of the issue, there are different techniques for identifying, the most relevant causes from all the ones previously listed. This analysis can also lead to the generation of alternative solutions (Dorsch, Yasin, & Czuchry, 1997). Misselhorn (1978) noted that the root cause should be the basic cause that is the reason why the problem is occurring.

The variety of root cause analysis methodologies range from ones that are simple to use, like the change analysis, barrier analysis, and cause and effect analysis, to others that are very complex, for example, events and causal factors analysis, tree diagram, and management oversight and risk tree (Dorsch et al., 1997). Arnheiter and Greenland (2008) explained another technique for obtaining root causes, this is the Five Whys methodology which consists in asking five times why when a problem appears, after answering that question for the fifth time, it is guaranteed that answer would be a root cause of the analyzed problem.

Finlow-Bates (1998) stated that the Five Whys and the Fishbone Diagram are methodologies that can lead to making mistakes because there is no way to differentiate a speculation from a real cause. He suggests following a methodology related to risks through which questions are answered and different courses of action can be identified, making decisions at different stages of the root cause analysis for finally finding an action that would have a sustainable long term effect.

3.2.9. Alternative solutions

Following the problem solving process, there is the step where alternative solutions are generated. As previously mentioned, in this part none of the alternatives should be criticized, so all proposals must be considered. All the logical and rational thinking should be put aside and try to be as creative as possible in order to obtain a large collection of possible solutions for the problem (Misselhorn, 1978).

Knippen and Green (1997) described a technique for obtaining more and better options for solution, brainstorming is very effective because people speak their minds and the generated solutions are of better quality and riskier. If just one person is in charge of looking for alternative solutions, this person may see just what is in front of him or her. On the other hand, when there is a group, sometimes the others' ideas may make you come up with things that you could not have thought of in your own.

In brainstorming the focus should be in getting more ideas rather than putting a lot of effort in the quality and feasibility of each of them (Misselhorn, 1978). The way brainstorming works is that one idea brings another one and then the flow of ideas becomes faster, after this all alternative solutions should be evaluated in order to get a few that are feasible for a further assessment to get the one that would be implemented. It is good to include persons from a variety of backgrounds so the problem can be tackled from different perspectives (Knippen & Green, 1997).

3.2.10. Solutions assessment

After the alternative solutions are generated, this step is about evaluating the advantages and disadvantages of each alternative. It is important to involve a group in the problem solving process, even if the group leader is the CEO, it is important to use others' expertise for choosing the best solution considering different aspects of the business, and getting them to support the results (Knippen & Green, 1997). According to Misselhorn (1978), the solutions should be evaluated following a specific criterion, a weighted ranking of alternatives can be elaborated if the complexity of the assessment requires it.

Kolfschoten, French, and Brazier (2014) explained a sequence of steps for performing the evaluation of the alternatives. The first step for the solutions assessment is deciding on some criteria that will be used for evaluating each alternative, there are several aspects to evaluate but the problem solving team should agree in a smaller set of factors to evaluate the

options. After this, the solutions are assessed in terms of the previously defined criteria. This is performed in two phases, one is the individual and the other one is in group for determining if the group agrees. Finally, the results of the evaluations are aggregated for finding out the group's decision, if there are major disagreements, these are evaluated in this final step.

3.2.11. Operations management

According to Silver (2004), operations management is the area of an organization that is in charge of overseeing and planning all of the processes that transform limited resources into the products that the company offers to its customers. This concept can have two different approaches, when that management supervises all the areas of a company or just some specific operations. Even though operations management regard to the production of the products, it is related to the other areas of the company in different ways. Its activities can be performed in any department of the organization. At first, operations management was just and study and research area, then it evolved into a managerial science with a functional approach (da Costa, Gouvea, & de Lima, 2010).

Chase, Aquilano and Jacobs, as cited by Silver (2004), explained another definition for operations management based on the fact that it is another functional area of a business. They relate the concept to the design, operation and improvement of the processes that generate the goods and services that a company offers. They compare operations management with other areas in the organization because the main objective is to obtain the product for the customers and this is not only because of the production systems but for a complex network of effort from different areas like marketing, finance or human resources.

Another aspect to consider is the production management, as previously mentioned, operations management directs all the processes that transform the input into products. Kumar and Suresh (2009) stated that production management controls the activities related to production, it involves supervising, designing and planning. It manages the transformation of

different resources in the production system of the company in order to obtain final products which have a value added according to the organization's plan. From this, it can be concluded that production management falls under operations management.

3.2.12. Production

The production is the function of the productive system which is to transform the resources into products. This transformation can take different forms and the materials can experience chemical and physical processes, an example can be an assembly line where pieces arrive separately and are assembled in order to obtain one final product. Bellgran and Säftsen (2010) explained that the system has a goal which is to change something from its current situation to a desired state following certain specifications stated by the company and demanded by the clients.

Fleury and Fleury (2007) reported that the previous concept of transforming inputs into outputs is too vague for the current situation in which the companies operates because it is very dynamic and driven by change. The function of production takes different configurations depending on the company, even within one specific sector, the characteristics of the production can vary greatly.

Jylhä and Junnila (2013) stated that several industries have stopped thinking of production as a black box where resources become products, now companies are treating the production from a transformation and value perspective putting a lot of importance in the value creation process for the customers, paying detail to how each process can affect the customers.

The production system is formed by subsystems which includes the human system, the technical system, the information system and the management system. The interaction of these subsystems allows the transformation of input to output. This transformation involves the added value given to the final product, the characteristics of the product depend on each

organization's parameters and can take different forms, for example the transportation from place to another is also considered an added value obtained through the production process (Bellgran & Säfteen, 2010).

Kumar and Suresh (2009) explained another definition for production which can complement the one given before. The authors refer to the concept of quality and state that production is a process where some materials are converted from one form to another following certain quality requirements given by the company. The value adding process is mentioned by them too, the authors specify that value is added in every phase of the production until the final product is obtained.

3.2.13. Capacity

When a company is created, one of the most important decisions is about the capacity for producing. The capacity is how much a company can produce in a specific time interval. This factor becomes a strategic decision because it can be an ally or a restriction for future company growth. According to Hammesfahr, Pope, and Ardalan (1993), a very improbable scenario is that a company produce at full capacity because it is extremely rare that the demand would meet exactly the offer of the products. If the production runs using the whole capacity of the plant, problems within the production would be easy to manage, not to mention the fact that the resource planning would be simple considering a constant flow of production.

Stevenson as cited by Johnson (2001) described a concise definition for capacity, it is the maximum production that an operating unit can achieve. The term operating unit can take different meanings such as an employee, a plant, a machine, etc. The author also mentions that there are some key factors for having a successful capacity management, for example the infrastructure, the goods or services portfolio, the processes, human resources, and other external sources.

Adenso-Díaz, González-Torre, and García (2002) explained that in the case of the services industry the capacity is determined by the quantity of resources available to carry out the demand. The main objectives of the capacity for services are to reduce queues and not to have unused resources. The definition of capacity for the services industry is the number of customers that the company can service in a certain amount of time. In contrast with the manufacturing sector where the capacity mainly depends on the facilities that the company possesses, the capacity of a service company depends heavily on the resource planning in order to successfully cover all the demand.

If a company is working at full capacity, then there might be some issues that would need attention from the operations department. The first potential problem is that the production could not enough to cover all the demand of the products, that is why the system is working at full capacity. Another possible issue is that the demand is regular but the inventories of finished products are increasing rapidly month after month, this have a direct impact in the warehousing costs (Hammesfahr et al., 1993).

3.2.14. Capacity planning

Capacity planning consists in defining the maximum production of a system, Hammesfahr et al. (1993) stated that there can be two approaches for making this decision, the first one is to have enough capacity to cover the minimum demand and the second one is that the capacity should be adaptable in order to change according to the demand. The authors mention that is hard to achieve since both options have different implications, so the companies should have either two different facilities or agree to follow one approach.

Capacity planning have different approaches depending on the maturity level of the company, for example, in a new business, managers are more worried about capital budgeting and do not pay attention to the facilities used for production. Later when the company wants to grow, they just add more facilities at the time it is requested. With the years of experience,

the company start adopting the capacity planning as a key element of its strategic planning (Hammesfahr et al., 1993).

Capacity decisions also vary depending on the production system that uses, Hill, Costa, and Jardim (1992) explained that for a jobbing plant, the capacity calculation is very complex because of the wide variety of products that are produced, the bottlenecks in the production process change depending on the product.

In the case of the service sector, capacity planning can take four approaches as described by Betts, Meadows, and Walley (2000). The first approach is that the companies decide to keep their resource planning stable and have a constant supply, another one is if the businesses decide to adapt their capacity to the demand, the third one is that the company implements a queuing system through which clients will be serviced after waiting some time, the last one relates to managing the demand by launching promotions like discounts in certain seasons in order to generate demand when there are idle resources.

3.2.15. Demand planning

It is the process through the demand is planned and projected. According to Ashayeri, and Lemmes (2006), the context of globalization and increased competitiveness have affected the markets to be more fragmented and unpredictable, this complicates the demand planning because now more information is required in order to get a realistic plan for the demand. If the demand planning goes wrong, then the company may end up with unsatisfied demand or with a high level of inventories.

Hübner, Kuhn, and Sternbeck (2013), in the same way, explained that this dynamic environment is making companies to involve purchasing trends, consumers habits and reactions in their planning processes. They explain that an inaccurate demand planning would affect the entire supply chain operations generating inefficiency problems. Pan and Kleiner (1995) reported that companies want to achieve a good planning in order to make an efficient

use of the resources to cover the demand, the decisions for this planning integrate factors such as materials, human resources, inventory levels, and product portfolio.

A solution to this changing environment would be to create a closer relationship with the marketing department since they have the latest information about sales and market trends. Working side by side with marketing would generate a better demand planning which would enable the company to act fast for increases of the demand, thus increase the market share (Ashayeri & Lemmes, 2006).

3.2.16. Production systems

Matt (2008) defined the production systems as a collection of resources, like people or equipment, and procedures put together to perform the manufacturing operations of a company. The author mentions that the production systems is formed by subsystems which add value to the materials during the production process.

There are different types of production systems as described by Metaxiotis, Ergazakis, and Psarras (2001). There is job production which produces one item at a time because the specifications vary greatly from one product to the other. Batch production is when the production is performed intermittently. Finally, continuous production is when the process works 24 hours per day, it does not stop.

Rösiö and Säfsten (2013) explained the importance of the adaptability that the production systems should have, the authors mention that if the companies would be able to create flexible production systems, the response to the constant changes in the demand and consumer habits would be faster and easier to solve because the system could be reconfigured to what is needed at the moment.

3.2.17. Types of operations

The type of operations that a company depends on what is being produced, either a good or a service. There are some attributes to distinguish between goods and services.

Corrêa, Ellram, Scavarda, and Cooper (2007) and Spring and Araujo (2009) described four attributes that the services have. The first one is intangibility which means that there is no physical presence of the service, the second one is heterogeneity which refers that the services cannot be completely standardized, the third one is inseparability which relates to the simultaneous production and consumption, the last one is perishability that refers to the fact that services cannot be stored or transported.

Prajogo (2006) explained that there are some services that require more human resources than manufacturing processes, the trend in manufacturing is to replace human labor with machinery but in services the persons are required to keep contact with the clients. Since in services the one receiving the processes is the customer, companies do not only pay attention to the final result but to the whole process in order to guarantee customer satisfaction at all levels of the value adding procedure.

Morris and Johnston (1987) proposed three different types of operations depending on the input that is used, these are customer processing operations, information processing operations, and material processing operations. The common characteristic is that they all use similar resources like machinery and labor. In the customer processing operation, a client is received and is given a service. The information processing operation occurs when raw data is analyzed and transformed into usable information, this can be the final product or an input to some other operation. In the case of the material processing operation, the material goes through processes for being transformed into a final good.

3.2.18. Strategic role of operations

As it has been previously mentioned, the current context involves fragmented markets and complex demands, this changes the panorama in which companies develop because they want to fulfill all customer demands. At this point demand forecasting is complicated and is becoming more inaccurate, all the methodologies related to history analysis are not useful

anymore because events differ on from another greatly. Operations management now is considered a strategic asset through which companies can become successful by shaping their capabilities in the long term in order to increase the responsiveness to market changes (Lowson, 2002)

Sundtoft and Mouritsen (2013) affirmed that operations are the core activity of a company, the trend is that these operations are taking a more integrative approach by including the activities of suppliers and customers. This increases the complexity of the operations management because the interaction level between the parts becomes more intense. The authors present the enterprise resource planning systems (ERP) as a measure to adopt by those companies who want to success in the current business context. They mention that the interactions between suppliers and buyers could be more agile but also there is a downside to the ERP because some managers perceive as a risk and uncertainty creator.

Lewis (2003) explained that if a company wants its operations management to be a key strategic factor, the organization should align its operation management practices to the strategic management ones. Superior operations capability has the potential to increase the efficiency of an organization, this can be achieved by cost reduction or product flexibility. If a company makes the effort to develop an efficient operations management, this can become a source of competitive advantage in the long term. (Yu & Ramanathan, 2016).

3.3. Conclusions

The literature review focused in problem solving in companies related to operational capacity management which is the type of problem that SIMA-Perú SA is facing because the company does not have enough installed capacity to increase its business. This literature review explored the available information contributing to gain a better understanding of the main topic which was divided in two sections, one related to problem solving in companies and the other one to operational capacity management, this allowed a deeper research in both

topics. For each section, the key concepts were researched in order to focus in the most relevant aspects of these.

The literature reviewed showed the complexity of the problem solving process which consists in a logical sequence of steps, each of these has some methodologies that can be applied in order to solve the problem effectively. The concepts of business problem and business analysis were also researched showing the complexity of problems that can appear in an organization and how important it is to conduct regular analysis in order to verify the existence of potential problems. The theory reviewed will guide the development of this project in the next chapters when the problem solving process continues.

The research conducted about the topic related to operational capacity management offered a broad understanding of how the operations management can become a source of strategic advantage for a company. The importance of the capacity planning is emphasized as a factor that can restrict future growth in a company. Operations management is about directing and supervising the process of transformation of resources into final products. The types of operations are also explored because the company operates in the shipbuilding industry and also in the maintenance services sector. This is also related to the concept of demand planning, as mentioned before, these functions nowadays play a fundamental role in the performance of a company.

Chapter IV: Qualitative/Quantitative Analysis

An analysis of each aspect of the key problem chapter is performed with the objective of having a better understanding of the implications of this problem.

4.1. Location

Having a limited capacity is affecting more departments than just the business of maintenance and repair. There are different aspects to consider like using old machinery which is directly influencing manufacturing as this department cannot work as efficiently as possible. It is possible that the equipment which is not up to date influences the quality of service of the entire company. To ensure that all employees know how to properly handle the outdated machinery, extra training is required.

The strategy department of SIMA-Perú SA is limited in its ability to plan ahead. The current lack of capacity, to serve a greater number of larger vessels, makes it difficult to plan for future demand because the operation center in Callao cannot fill this need. The strategy department has restricted human and financial resources and must account for these resources if the company begins to make plans to expand or be more profitable. The limited capacity of the company to service larger ships has to be taken into account as it acts as a restrictor to future planning.

Furthermore, limited capacity affects the bottom line of the business as the organization is missing out on business from potential clients that are seeking repairs for Panamax type ships. The marketing department could do a great job attracting lucrative business from private clients, however, the limited capacity and the fact that they cannot maintain or repair Panamax ships, puts a limit on what the company can achieve at the moment.

Limited capacity can have a further reaching impact. The reputation of the company may become damaged due to increased waiting times or due to not being able to fulfill

customers' needs. This can have consequences on the entire business of SIMA-Perú SA as the customers can turn to competitors in China, Chile, or Panama.

4.2. Ownership

The main area of SIMA-Perú SA affected by the limited capacity for receiving more and larger vessels is the maintenance and repair business unit. This unit needs adequate facilities for servicing the ships, otherwise its productivity is diminished. The ship industry has become more efficient with larger vessels transporting goods on all oceanic lines. However, SIMA-Perú SA has not adapted its operations to the trends in its industry. This has created a mismatch between the resources that the company possess and the market opportunity.

Space, land and machinery play an important role in the maintenance and repair business. If there is not enough space in the port, ships will not be able to park and receive services in SIMA-Perú SA's facilities. Additionally, if there is not enough land available the capacity of the port cannot be expanded. Dry docks are crucial to repair because they can be drained of water in order to thoroughly inspect and maintain and repair a ship. Currently, SIMA-Perú SA does not have a dry dock to service Panamax or Post-Panamax type ships, which are some of the most widely used commercial vessels. This limits the business action of the company because some clients cannot be received, and considering the location of the port of Callao, the increased traffic of ships already exists.

The maintenance business works on a contract basis where conditions regarding the number of ships to be serviced, the type of service required, price and other aspects allow for scheduling on specific dates. Maintenance has a bigger impact on the financial performance of the company compared to shipbuilding because it has higher profit margins, less labor intensive, and the prices are more often internationally based. In the case of repairs, the nature of requests is unpredictable because they are mainly due to accidents or ship break

downs in an area close to Callao. This impacts the efficiency of operations and level of risk when there are too many or too few requests.

Another area affected is the marketing department due to its scarce activity in market research. The lack of market studies and business intelligence initiatives have contributed negatively to the company and largely explain why operations are not current with industry trends. The marketing department is also in charge of seeking potential clients so there is a secured demand for SIMA-Perú SA. With regard to the human resource department, personnel often sit idle because staff are not hired on a contractual basis, rather they are hired on salary terms. Even if the port is at full capacity, some projects require more labor than others which means that sometimes there is nothing for personnel to do.

As previously mentioned, SIMA-Perú SA is a state-owned company and is managed by FONAFE, a government entity in charge of looking after the performance of most of the state-owned companies. FONAFE representatives are part of the organization's board of directors, thus all the strategic decisions must be approved by them. When an investment is required, FONAFE plays a crucial role because ultimately they approve the funding request. Therefore, support from FONAFE of the project is necessary.

All project proposals must include feasibility studies that contemplate the impacts of the execution of the project as well as the resources needed. FONAFE's decision for approving the investment is guided by some principles stated in the manual for public investment. It states that all national investment projects have to be aligned with the country's objectives (Dirección General de Inversión Pública, 2015).

According to Peru's strategic plan, there is a strategic priority related to the economy, competitiveness and employment. Under this priority, the country aims to achieve a dynamic and diversified economy, competitively integrated into the global economy, and to develop a domestic market; all of this within a stable legal framework that can promote private

investment to generate high levels of employment and productivity (CEPLAN, 2011). An investment for expanding SIMA-Perú SA's facilities falls under this priority because it will be an important factor for the consolidation of the port of Callao as an international commerce hub. In addition, worthy of mentioning is the creation of employment.

4.3. Magnitude

Considering that SIMA-Perú SA is publicly owned, the company needs to obtain more private clients to provide the necessary revenue to generate profit. The organization holds certain business units, such as metalworking, to solely adhere to government requests which do not generate profit for the company. Thus profits are reliant on the work done for private clients.

Currently, while completing government assignments, SIMA-Perú SA is not generating nor losing income. The largest problem with this is that the company does not have the capacity to work on vessels for both public and private clients simultaneously. Within the industry, ships may lose out on profitable periods because of time spent for maintenance and repair (Gratsos, & Zacharidis, n.d.). At the Callao operations center, the time spent for maintenance and repair of private vessels risks being extended which results in losses to the client and late penalties to be paid by the SIMA-Perú SA because naval vessels take precedence over private clients.

SIMA-Perú SA requires a second dry dock to continue work on private clients along with a new dock that can accommodate the Panamax and Post-Panamax ships. These types of ships are flooding the traffic through the Panama Canal, which is where the company receives its clients. Lack of predictability for when naval vessels, private clients, or other opportunities require attention is a large factor contributing to low profitability. The literature describes how generating predictability could provide stability for ship building and maintenance companies. This knowledge would create a less disruptive labor force, in terms

of the hiring and layoff cycle, it would further incentivize infrastructure improvement because of the assurance of realizing investment, and this stability would create confidence within the supply chain (National Defense University, 2015). The addition of capacity is a means to predicting and stabilizing business at the Callao operations center. Increased capacity allows naval vessels to receive attention, while still allocating room for other public and/or private clients. Therefore, a sense of stability could be realized if the Callao operations center could effectively accommodate multiple vessels, and this stability could generate profit for SIMA-Perú SA.

If the company were to capitalize on the opportunity of the increasing traffic through the Panama Canal by building a Panamax dry dock, the benefits could be extended throughout the organization and the country. SIMA-Perú SA is requesting that the development of a dry dock at the port of Callao be funded by the central government; this requires a detailed report outlining the social impact that will occur upon approval of the investment required for the increased capacity.

Some of the social benefits include an increased GDP for Peru, employment opportunities, and increased port traffic. While creating a social impact, the company will be recognized by the state and central government for their contribution to further developing Peru's economy. These social benefits far outweigh the corporate benefits that SIMA-Perú SA will gain from the increased capacity. Though the Callao operations center will be able to accommodate and profit from more clients, the core of their business will not be changed, but expanded. The implementation of a dry dock, to further increase capacity, will still comply with SIMA-Perú SA main business unit of ship maintenance and their loyalty to the Peruvian Navy.

This is an incredibly important opportunity for the company and for Peru. The lack of current capacity is reflected only upon SIMA-Perú SA, however the potential solution to this

problem (implementation of a dry dock to increase capacity) is important for all stakeholders. The company, along with the shipbuilding industry, is not a profitable company. However, with the expansion of the Panama Canal to accommodate Panamax and Post-Panamax ships, there is a potential to profit. Chile and Panama are the only competitors capitalizing on this opportunity, leaving Peru in a prime location for client access. The number of Panamax type ships within the canal that require maintenance would outweigh the costs of maintaining each unit.

4.4. Time perspective

The Panama Canal connects the Atlantic Ocean and the Pacific Ocean and it is vital for the international transportation of goods from all continents. In 1881, France began to engage in the canal building. After that, the United States took over the project and opened the Panama Canal in 1914. The United States has been in charge of the canal until 1977, when it was handed over to Panama (Panama Canal Authority, n.d.). The traffic through the Panama Canal has continued to increase since its opening in 1914 to 12,386 ships in 2015 (Panama Canal Authority, 2016). The Panama Canal further expanded in 2007 and reopened on June 26, 2016. The capacity was expanded to be able to receive ships that can carry 12,600 containers (McDonald, 2016).

The Panamax is a type of vessel whose size is limited by the Panama Canal dimensions and the requirements are regulated by the Panama Canal Authority. Since 1969, the Panamax type of ship has been sailing the oceans and rapidly developed to serve the shipping industry associated to the international trade development. The Panamax evolved into the bigger Post-Panamax ship, and after 2009, the New Panamax was released onto the market with the anticipated expansion of the Panama Canal. The Panamax type of ship has been prevalent in international commercial logistics as its large capacity is able to optimize time and cost efficiency.

According to the Panama Canal Authority report, in 2015 there were 35,544,694 tons of cargo movements through the Panama Canal from Europe, Asia, Africa and other places in the world to the west coast of South America which represents 25.9% of all the cargo carried across the Panama Canal (Panama Canal Authority, 2016). Of all the transit that goes through the canal, 24.9% were Panamax cargo type ships (Marine Traffic, n.d.). Considering the 2015 traffic which was 12,386 vessels, it can be deduced that 3,208 came in the direction of the west coast of South America, and from those vessels, 799 were Panamax type ships. In other words, approximately 799 Panamax ships move around the west coast of South America annually. Considering a growth rate of 4% which is the rate in which traffic has been increasing in the Panama Canal in the last years, in 2021 the potential demand could be around 973 Panamax type vessels. In the absence of dry docks for Panamax type ships between Panama and Chile, the port of Callao in Peru, which is located at the center of the West Coast of South America, stands as a strategic potential maintenance port for passing-by Panamax ships.

Peru itself is one of the leading countries in the shipping industry. In 2015, Peru ranked fifth place of total cargos by origin and destination in the world after the United States, China, Chile, and Japan. With 18,793,667 inbound and outbound cargos, Peru demonstrates a significant capability of international shipping (Panama Canal Authority, 2016). As trends in globalization continue and with the recent expansion of the Panama Canal, the number of Panamax type ships passing through the waterway is expected to increase significantly in the coming years. This reveals a big opportunity for SIMA Callao to expand its current capacity, extend its service and develop its shipping business.

4.5. Conclusions

Currently, there is a mismatch between the resources that the company possess and the market opportunity that exists. The literature review emphasized that the current business

environment is very dynamic and that the production systems should be flexible in order to offer a fast response to the changes in the demand. The restricted capacity affects the business because the company cannot attract more clients nor make notable profit, the research showed that the issues with capacity are related to a lack of facilities or resources. This is the case of SIMA-Perú SA because it does not have a suitable dry dock for large vessels like the Panamax ships.

The intensity of international commerce is increasing and this brings a bigger ship traffic. Vessels are larger in number and dimensions, and SIMA-Perú SA does not have the adequate facilities to receive them. This impacts directly the maintenance and repair department as there are potential clients that cannot be serviced. Another aspect to consider is that there are months where the number of requests exceed the capacity of the company, this is determined by the number of dry docks and an inefficient demand planning. The review of information showed that demand planning is important in order to have efficient operations, because the resources will be planned based on the forecasted demand.

It is important to state that SIMA-Perú SA is a strategic asset for the government of Peru because it is in charge of servicing the Peruvian Navy and its facilities are conveniently located next to the commercial port in Callao. The opportunity of increasing the capacity goes beyond the potential benefit for the company itself, it would have a variety of positive impacts in the economy, society and technology.

Chapter V: Root-Cause Analysis of the Problem

5.1. Identified Causes

A cause and effect analysis was developed with the objective of finding contributors to the main problem. This methodology starts by setting the problem statement, then, it is required to identify categories in which the possible causes can be classified, finally, all the possible causes should be listed under each category. The result of the cause and effect analysis is shown in Figure 6.

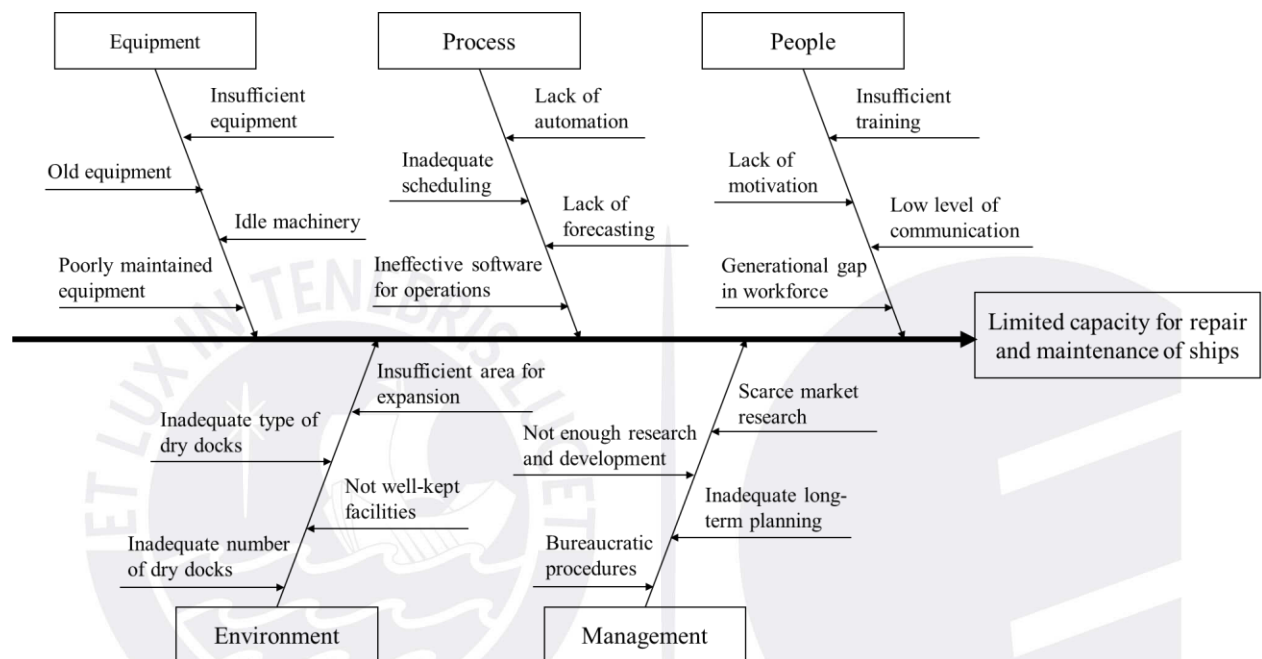


Figure 6. Cause and effect diagram for the limited capacity of SIMA-Perú SA

5.1.1. Equipment related causes

As SIMA-Perú SA is a company focused on repair and maintenance of ships, it requires a large initial investment in machinery along with high maintenance costs. With improper equipment, the organization is unable to effectively adhere to all client requests. Lack of well-maintained equipment creates a large influence on the capacity available for the company to provide its services.

- Insufficient equipment: SIMA-Perú SA currently holds equipment and machinery, specifically cranes and docks that satisfy the needs of their current business units and

demand. However, no equipment is available to hold more demand or capitalize on the growing market. This growing market includes both the traffic within the Panama Canal and the size of the ships. Panamax and Post-Panamax ships are growing in popularity and the company is unable to accommodate this demand with their current equipment. This is also a problem for the organization because with the current equipment they hold, they cannot accommodate multiple clients at once. There is not enough equipment to cater to both the Navy's demand and private clients.

- **Old equipment:** The average age of equipment in the Callao operations center dockyard is approximately 40 years. Within four decades the ship yard industry has expanded immensely in terms of global reach and technology. The equipment that is currently in place does not utilize the available technology and the benefits of increased efficiency and effective ship repair, building and maintenance. Not utilizing the advancements in technology also effects the clientele that the company is able to serve. As the old equipment does not process newly implemented technology, clients with advanced systems and structures cannot be serviced by the SIMA-Perú SA. Similar to technology, global ships have different systems that require specific equipment and technology to perform repairs. Having old equipment limits the number of clients SIMA-Perú SA is able to service because they are not able to accommodate more modern vessels.
- **Idle machinery:** SIMA-Perú SA is currently facing an issue of lack of capacity to service both public and private clients. Though the company needs to increase and enhance their current equipment inventory, they also need to utilize all equipment. Currently, the company holds idle machinery that is not utilized because it is not required for all business units. Holding this machinery generates a higher cost of inventory and greater depreciation. Acquiring clients who require the use of the idle

machinery would increase capacity, revenue, and counter the costs (maintenance, repair and accumulated depreciation) of such equipment.

- **Poorly maintained equipment:** A result of idle equipment, old machinery, and overused equipment SIMA-Perú SA's equipment inventory is poorly maintained. The equipment that is most often used requires repetitive maintenance, which is not occurring. The life span of this equipment is long, however it is observed that the depreciation is high. With high depreciation and high maintenance costs, the opportunity to invest in new equipment is greatly minimized. Not holding superior equipment compromises capacity.

5.1.2. Process related causes

The processes in which SIMA-Perú SA currently operates is not effective for current operations and/or forecasted operations. There is a lack of communication among employees due to no standardization, forecasting, and lack of ERP.

- **Lack of automation:** Ship repair is the largest business unit for SIMA-Perú SA. Within this unit, there is not a standardized process for repair. The company does not enforce automation in their daily tasks, nor with their machinery. Each assignment is tackled individually and does not follow a specific automated schedule. This is inefficient and leads to many communicative problems. Lack of automation reaches the machinery used. There is not a standardized way for operation of each piece of equipment in terms of where that equipment is best utilized.
- **Inadequate scheduling:** SIMA-Perú SA's priority lies with the Peruvian Navy. This priority includes scheduled and non-scheduled assistance. This often interrupts private client work and causes great delays. There is not a properly implemented schedule to ensure all tasks are completed on time. This inadequate scheduling also extends to the downtime in all business units. The company holds downtime in all units while at

other times they are over capacity. There is not an effective means of scheduling for individual units or for the company as an entity.

- **Lack of forecasting:** Due to the uncertain demand of the Peruvian Navy, SIMA-Perú SA is unable to forecast their available capacity. Private client work is secondary to naval vessels regardless of which project began first. A forecasting system for demand and/or available capacity has not been implemented within the company, and this affects the ability of the company to plan ahead the distribution of work.
- **Ineffective software for operations:** Though SIMA-Perú SA holds a processing system, they do not have an ERP to track and plan all processes. The system that is currently in use does not have many functions, allow for great detail or extensive planning. With the company being such a large company, the lack of software is a crucial implication for process tracking and forecasting.

5.1.3. People related causes

SIMA-Perú SA has a very large work force however it has no means of communication amongst all levels of employees. The employees are not motivated, improperly trained, and face challenges with generational gaps. This is a large issue for the efficiency and fluidity of production within the company.

- **Insufficient training:** As the company does not have the budget to hire very experienced professionals, they must rely on their current staff to complete extremely technical projects. SIMA-Perú SA receives government projects that are very risky, dangerous, and technically demanding. Employees are not extensively trained to complete tasks that should be completed by more technically experienced and knowledgeable professionals. The company does not have a standardized training program for all business units or for all skill levels of employees that can ensure a talent development scheme within SIMA-Perú SA.

- Lack of motivation: Employees do not have the opportunity to continuously grow within SIMA-Perú SA as this is not a profitable company. There is a salary cap, limited promotional opportunity, and limited mobility within the company. This is a large demotivating factor and causes many employees, specifically engineers who can earn greater wages in the private sector, to leave the company and relocate to an organization with higher opportunity. Lack of motivation also arises from the demanding government requested projects that do not generate any profit. Extensive effort goes into these projects, such as bridge building and other metal works, and no profit or recognition is awarded to the company.
- Low level of communication: The structure of SIMA-Perú SA is under naval terms, which is a very hierarchical structure. Within this hierarchy, there is a lack of communication to all levels of employees. Not all employees are informed about all areas of the business or provided with crucial information. Another reason that contributes to the lack of communication is the lack of automation that occurs within the processes. There is not a structure implemented that ensures all employees can communicate and receive information.
- Generational gap in workforce: As SIMA-Perú SA receives post-secondary interns, who are trained and mentored by experienced long-term employees, a large age gap is created within its workforce. This generates problems with developing adequate training programs, feedback structures, and implementation of technology. This also has an effects in the attitude towards change, older generations are more reluctant to change than younger employees. To adhere to all generations, SIMA-Perú SA must be able to accommodate the elder employees while still stimulating the interns and new, young hires. Currently, the company does not have a system which accommodates and integrates all the generations and mitigates the gaps.

5.1.4. Environment related causes

SIMA-Perú SA operates in the Port of Callao. The Peruvian Navy is also located in the Port. In its current arrangement, there is not enough area for the company to expand its capacity to include a larger dry dock. In addition to the physical location, the current number and type of dry docks are inappropriate to meet the customer demand, and the facilities are not well-maintained.

- Insufficient area for expansion: SIMA-Perú SA's operations are currently located in the Navy base in Callao, the area is shared. As it stands, there is insufficient area for the company to build a larger dry dock. In order for the organization to expand their operations within the port of Callao, the Navy base will have to be re-located to the northern section of the port.
- Inadequate type of dry docks: The current type of dry docks is inadequate. The port needs to include installations to service modern vessels. They are inappropriately sized to market demand for ship maintenance and repair. The current docks do not meet the client requirements regarding to the size, too small, for larger ships such as the Panamax type. This limits the capacity of the organization for increasing its business, having the appropriate type of dry docks will improve the operation of the Callao branch and the port itself by attracting and engaging more clients, improving turn-around times and reducing congestion.
- Not well-kept facilities: The workplace environment impacts employee morale, productivity and engagement - both positively and negatively. The work place environment includes buildings, work stations and facilities that are not well organized or regularly maintained as well as other factors such as inappropriate lighting and excessive noise. SIMA-Perú SA's facilities are not well- kept or regularly maintained. People working in such environments are prone to occupational diseases

and the environment has an impact on the employees' performance, therefore productivity may be decreased due to the workplace environment. The quality of the work environment impacts the employee motivation, performance, as well as how they engage with the organization. The immediate environment where the employees perform their activities influences worker's error rate, level of innovation and collaboration with other employees, absenteeism and ultimately, how long they stay in the job. Creating a work environment in which employees are productive is essential to increase profits for the company.

- Inadequate number of dry docks: There is a mismatch between the capacity of the Callao operations center to service ships and the increasing demand for vessel services. SIMA-Perú SA's facilities cannot accommodate a good number of ships and this is affecting its business. There are many potential clients who are interested in receiving the services but in the Callao operations center there are some weeks where the shipyard is at full capacity, so the company cannot take any more requests for providing the maintenance and repair services.

5.1.5. Management related causes

SIMA-Perú SA is a state owned enterprise which requires that it adheres to bureaucratic guidelines and policies. It also must receive approval from FONAFE to invest funds into market research, and research and development. The state views the company's role to be to serve the Peruvian Navy and the country of Peru. As of yet, there has been no activity in developing long-term initiatives to leverage SIMA-Perú SA's capabilities to capitalize on servicing Panamax ships to benefit the economy of Peru.

- Scarce market research: SIMA-Perú SA has limited information regarding market trends in its industry. Since there is not enough market research, there has not been any proposals to expand the capacity of the port of Callao's operations center to

accommodate Panamax type ships. Even though Panamax units have been increasing in prevalence and there is an opportunity to service these ships along the South Pacific coast, as of yet this has not been realized. Before proposing to increase the capacity of the Callao operations center, SIMA-Perú SA will have to carry out a full-scale market analysis by collecting data relating to their target market, who the competition is, what is the price and service comparison and market performance of each competitor, specifically the ports in Chile and Panama. In addition, they need to discern how large the market is so that they can gain a clear idea of what level of penetration can be achieved through expanding their port and services. Market analysis is required to gain an economic overview to better understand the current market, trends and who the competitors are. As well as to identify business opportunities to be capitalized on, such as the increasing number of Panamax type ships passing by the port of Callao, and the lack of maintenance ports along the South Pacific coast. However, market research is limited because the company does not have experienced personnel who are experts in market research. It does not outsource this function because investment in such services would require that the company had profits to invest or had gained the approval of FONAFE.

- Not enough research and development: In order for research and development (R & D) to be effective, sufficient market research must be carried out to determine what is needed. If the development is finding activities that add value to the company's productive capacity through industry, then R & D should be directed toward developing products that market research indicates will meet an unmet need. R & D differs from the vast majority of corporate activities in that it is not often intended to yield immediate profit, and generally carries greater risk and the return on investment is uncertain. Significant financial investment into R & D is not possible because

SIMA-Perú SA has an obligation to the State, whose projects are not profit generating for the company.

- Inadequate long-term planning: SIMA-Perú SA's development can only become future oriented if growth comes from activities that add value to the country's productive capacity, through industry, technology and education. The company generates value for the economy of Peru by providing employment opportunities and creating demand for local businesses and industries. However, they do not consider long term action plans regarding future investments and where they want to be. The organization's short-sightedness is an extension of the government's view point. The challenge is finding synergies for the implementation of long-term planning for both the state and the company. This will require investments in the areas of market research, and research and development.
- Bureaucratic procedures: The company operates in a bureaucracy which requires that everything regarding SIMA-Perú SA operations and projects is done under a certain set of rules and guidelines. This system requires a large number of managers and administrative staff to ensure that everything is done according to state policies and procedures. Such bureaucratic procedures make it difficult for the company to be lean and agile as a company. There is an imbalance in the company's ability to follow procedure, and the ability to deal with new projects and research where more people and skill are needed.

5.2. Main Causes of the Problem

To maximize the effectiveness of the root cause analysis all possible factors that contribute to the main problem were identified. The casual factors made-up the cause and effect diagram, as seen in Figure 6. From this diagram all potential and real causes of the main problem were analyzed further to gain a better understanding of why the casual factors

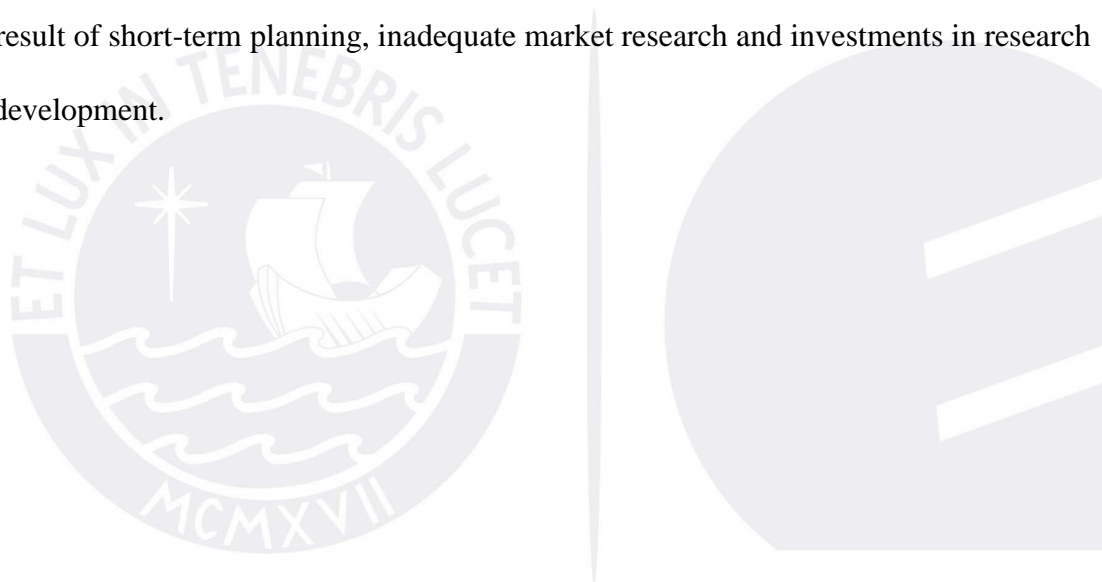
exist and what is the real reason for the occurrence of the main problem. The analysis utilized the Five Whys technique, used in the Analyze phase of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology. This methodology removed the layers of symptoms, revealing four primary causes of the main problem.

First, the current working environment, specifically the number and type of dry docks, is inadequate to meet market demand. The current docks are outdated and are not appropriate for the large vessels that dominate foreign trade and pass by the port of Callao. There is a mismatch between the docks that currently exist and the type of docks which are needed to service larger vessels. SIMA-Perú SA needs to install modern dry docks to service ships of the Panamax or Post-Panamax type. Having appropriately sized dry docks to market demand will improve the operation of SIMA-Perú SA as it will allow them to service more ships, improve waiting times and reduce congestion within the Port. In addition to not having the installed capacity to service larger ships, the area available to construct larger dry docks is another limiting factor to expanding the capacity of SIMA-Perú SA. In order to construct dry docks, to service larger Panamax type ships, the Navy base will have to be moved to the northern area of the port of Callao.

The second cause that was defined as a main one is the old equipment and idle machinery. This affects the productivity and capacity of SIMA-Perú SA. It is crucial for machinery to be up to date in order to accommodate the increasing technology in this industry. As vessels become more technological, the service must be updated to adequately maintain clients. The problem of idle machinery is the depreciation it is collecting. Having idle machinery removes the opportunity to invest in new or updated machinery. SIMA-Perú SA must remain competitive, current, and able; with old and/or idle machinery, the company is unable to achieve a larger client base, investments, or adoption of new technological advancements.

The third identified cause is the lack of market research. This limits SIMA-Perú SA ability to identify and determine the potential of market opportunities, and make proposals to expand the capacity of its operations in the port of Callao, to accommodate larger vessels and capitalize on the trend of increasing Panamax ship traffic along the South Pacific coast. With accurate market knowledge regarding market trends, ship traffic and competitors, the existing opportunity to service Panamax type ships could be demonstrated and proposals to expand the operations of the company to FONAFE could be justified.

Lastly, there is a lack of future-oriented planning and demand forecasting. The opportunity to service Panamax type ships has been present since their appearance in the 1960's. However long term action plans regarding this opportunity has not been considered as a result of short-term planning, inadequate market research and investments in research and development.



Chapter VI: Assessed Solution Alternatives

8.1. Alternatives to Solve the Problem

After completing a thorough analysis of the causes of the defined problem, and determining the main causes of the problem by using the methodology of the Five Whys, some potential solutions to remedy the root causes are proposed and evaluated. Each alternative focuses on specific aspects of the main problem including machinery, facilities and strategic planning. Table 5 shows the details of how the alternative solutions aim to impact the main causes of the problem that were identified.

Table 5

Alternative Solutions for SIMA-Perú SA

Key problem	Main causes	Solution alternatives
Limited capacity for repair and maintenance of ships	Old equipment and idle machinery	Update old equipment and adopt advanced technology
	Inadequate type and number of dry docks	Build a new dry dock
	Lack of market research	Invest in Market Research
	Lack of future-oriented planning and demand forecasting	

6.1.1. Update old equipment and adopt advanced technology

As mentioned before, SIMA-Perú SA employs many experienced and skillful senior employees who coordinate the operation of the company. However, they are not aware of the importance of the latest technology. SIMA-Perú SA does not possess an internal system for company management and updated machinery for the shipbuilding, maintenance, and repair business units.

On one hand, the organization needs efficient and standardized systems to manage the company operation and customer relationship instead of human-centered management.

Microsoft software accounts for 75% of the software implemented in the company (SIMA

Perú, 2008). However, it is not sufficient to support the internal information, flow of communication, data accessibility, and updating. A precise document management system is required to get a tracking system from product design to quality control, to integrate data on one platform, and use cloud computing to share information across all departments. At the same time, an ERP system is needed to improve the management and strategic planning process. In addition, a SAP system is recommended to develop the supply chain process and customer relationship management. The latest managing system is able to improve efficiency and take cost down.

On the other hand, in order to adapt to the rapid developing shipping industry, SIMA-Perú SA is encouraged to follow the international trend to realize technological development. The automation leader, Geoje shipyard in South Korea creates 30 ships a year and boasts the highest dock turnover in the world (Lo, 2013). The robotic system is the key factor for its success. Geoje shipyard originally utilized robots only for welding and now it uses spider robots to autonomously crawl over the surface of a vessel, blasting off the rust and other contaminants before it can be painted.

The robotic system highly improves efficiency and reduces human error. Learning from Geoje's experience, a smart and digital shipyard is the future for SIMA-Perú SA. In addition, CO₂ laser welding technology makes it possible for easy automation. Equipped with a suitable carrier, CO₂ welding can be automated for down hand, horizontal or vertical welding. It provides easier and faster welding, better quality and controllable length. Furthermore, 3D printing technology, which is claimed to be the Third Industrial Revolution, is gradually applied into shipping industry. The 3D printing technology is able to construct real objects from virtual 3D pictures. The prospect of this technique is estimated to be a quick replacement of ship's parts for repairing and maintenance (Sukant, 2015). It will surely increase accuracy and efficiency.

SIMA-Perú SA is restrained by its outdated equipment which result in higher costs and longer lead time. The outdated equipment is not appropriate for maintenance and repair services of modern vessels and often sits idle. In order to address this dilemma, SIMA-Perú SA is recommended to seek global collaboration and technology transfer with automation experts like Samsung Heavy Industrial. This will broaden the use of digitizing systems. By importing latest machinery and equipment, and innovative technologies from oversea, SIMA-Perú SA can quickly adapt to the digitalizing industry and meet the marine and offshore production demand.

6.1.2. Build a new dry dock

The main problem of SIMA-Perú SA is the lack of capacity for servicing ships in terms of quantity and size. A way of tackling both aspects is building a new dry dock of a large size so it can accommodate Panamax type and/or bigger vessels. With a larger dock, the company can receive more vessels.

For constructing the new dry dock, some arrangements must be made with the Peruvian Navy because of the proximity to the naval base which restricts the land for the expansion of the Callao operations center. The naval base would have to be moved to the northern area of the port, leaving an allocated space for the proposed project and possible future expansion plans. Time is an important variable to consider here because the project life span should contemplate the total time that includes the moving of the naval base and the construction itself, apart from the time needed for getting the government approval and authorization for implementing the project. Just the building process takes around two years (Soletanche Bachy, 2001).

There are additional benefits of implementing this solution that includes a positive impact in the Peruvian economy not only due to a potential increase in the company's profits but also because of the process of construction which would generate a good number of

temporal employments and could create other business opportunities for people living in the neighboring regions.

The long-term benefit is the creation of a strategic advantage for the country because it would be the only shipyard with capacity for servicing Panamax type ships in the oceanic line between Chile and Panama. This would help in the consolidation of the port of Callao as a major commercial hub in South America because of the additional services that could be given to the cargo ships.

SIMA-Perú SA is unable to finance the investment for the construction of the new dry dock. It requires almost 150 million USD, forcing SIMA-Perú SA to seek an additional budget from the government. The company would request the funds through FONAFE and fulfill all the requirements that public investment projects follow. One of the requirements is that the project is aligned to the country objectives. This investment has an important impact in economic aspects, related to the increase of employment and international integration, and social aspects because it would benefit people that live near the port of Callao area.

6.1.3. Invest in market research

SIMA-Perú SA does not possess a lot of market information; information about customers or competitors are not readily available. Before expanding the capacity of the company, more knowledge is needed. Deciding to build a new dry dock or purchasing better equipment is a rash decision since the company does not have feasibility studies to prove that new equipment or a new dock would lead to better performance. More information is needed about what consequences any type of expansion would have on the company.

The target market has to be identified first and it has to be estimated how much of the traffic, the demand for repairs and maintenance, could be captured by having an increased capacity in the Callao operations center of SIMA-Perú SA. It is hard for the organization to acquire the needed information since it requires capital and investment in personal.

Outsourcing this service is expensive and potentially not feasible at this moment. Market research has to be developed internally.

More knowledge about the market will also give the company a better overview of where SIMA-Perú SA positions itself in the market compared to competing docks in Panama and Chile, as well as competitors in China. Based on more information, the company can be able to improve strategic planning which would have an impact on more departments and functions besides the maintenance and repairs business of the company. The knowledge of the market can give a precise picture of when the best moment in time would be to tackle the problem of lacking capacity as well as provide more compelling arguments that could support new equipment or a new dry-dock and defend the decision with more credibility to FONAFE who has to approve any big investments.

This solution could be considered to be a first and cautious step in order to tackle the main problem of lacking capacity. Information is invaluable and SIMA-Perú SA does not possess all information needed in order to make wise decisions. Gathering information takes time and money and might be considered irrelevant information. However, the information might head the company into a direction that they already suspected to be the right decision to take. However, more information could give the management more confidence and the proposal for more capacity more credibility for the government.

6.2. Assessment of Alternatives

To determine which solution is the most suitable for solving the problem, each alternative is evaluated in four categories which are importance, feasibility, added value, and risk mitigation. Importance refers on how direct the alternative tackles the root causes of the problem, feasibility is about how easy it is to implement the solution, added value relates to how the alternative would impact the customer experience, and risk mitigation refers to how the alternative solution deals with risks. A ranking from one to five was awarded in each

category depending on the degree in which the alternative solution aligns with the specified criteria. A score of one in a category means that the alternative solution has a poor impact in that specific criterion, on the other hand, a score of five means that the alternative solution offers a great performance in the criterion. The solution that ranks highest is believed to be the most adequate and the one with the bigger impact in order to provide a greater chance for government funding. Table 6 shows the assessment of the alternative solutions for the insufficient capacity for servicing more and larger vessels in SIMA-Perú SA's facilities.

Table 6

Assessment of Alternative Solutions for SIMA-Perú SA

	Importance	Feasibility	Added value	Risk mitigation	Total score
Update Old Equipment and Adopt Advanced Technology	1	3	2	3	9
Build a New Dry Dock	5	2	5	2	14
Invest in Market Research	2	5	1	4	12

The proposed solution to address the limited capacity of SIMA-Perú SA is the construction of a new dry dock to service ships of the Panamax type. This solution was chosen because of its performance on the criteria that was previously specified is the best compared to the other two options. In order to implement any of the proposed solutions, SIMA-Perú SA requires government funding. The government's current focus is generating a socio-economic society with proven social impact. This solution has the potential to generate a positive political, social, economic and technological impact for the country of Peru over the other alternatives.

Market research is a preliminary step to constructing a dry dock, however SIMA-Perú SA has recognized that the opportunity to service Panamax type ships has existed since the emergence of these vessels. Although as of yet this opportunity has not been seized. No

formal market research has been conducted, however the company has experiential knowledge about the demand for this service and the potential for SIMA-Perú SA to fulfill this need. Building a new dry dock will have a greater and more immediate impact for the company and Peru than gathering market information and updating the equipment.

In order for SIMA-Perú to gain stakeholder approval this will require a feasibility study, a grant of adequate funding, carry out evaluations of potential contractors for the construction phase of the new dry dock, a proposal that exemplifies the social impact SIMA-Perú SA can have with increased capacity.

This will require an agreement between SIMA-Perú SA and the Peruvian Navy that the Naval base will be moved to the northern part of the port of Callao, contingent on gaining stakeholder approval of the construction of the new dry dock. Following the construction of the dry dock, artisan fishermen will have to be relocated to the designated port north of the port of Callao, called Ventanilla. This port was constructed by the government in 2014 to address congestion issues in the port of Callao, however up until now these fishermen have been reluctant to move.

6.2.1. Limitations of updating old equipment and adopt advanced technology

This is not a profitable industry, therefore SIMA-Perú SA is unable to invest in the purchase of new equipment. This investment still requires outside support from the government stakeholders to provide funds any purchase of new equipment or updating the existing equipment.

Updating technology will potentially generate a larger profit for this company by creating capacity for more clients, however it will not accommodate ships of larger size. In conclusion, this alternative could also have a direct impact in solving the problem but its scope does not cover both sides of the issue which are related to quantity and dimensions of the vessels.

6.2.2. Limitations of investing in market research

Market research is labor intensive, time consuming, requires information sharing, and comes at a high cost when companies do not possess the internal expertise. SIMA-Perú SA does not have personnel that are experts in the realm of market research. In addition, because it is a state-owned company they must adhere to bureaucratic procedures and gain approval from different levels of Government to hire this service externally. This delays data collection and research.

The shipping industry is specialized which may mean that marketing firms existing locally in Peru are not apt to gather information about the shipping industry outside of Peru. This could lead to inaccurate information or delay the process of collecting this data. The collection of primary information from interviews with industry players is more meaningful for the shipping industry but also more time consuming compared with secondary information that is acquired from public sources. In addition, change is constant in fast-paced environments and new advances/trends are being made all of the time, this requires information to be up-to-speed and relevant.

The time and cost involved with outsourcing market research to a third party is not more advantageous compared to taking more immediate action to seize the known opportunity of servicing the increasing number of Panamax type ships passing along the South Pacific Coast. It should be noted that a part of the proposed solution will include market research for presenting the feasibility of constructing a new dry dock to the prospective stakeholders.

Chapter VII: Proposed Solution

SIMA-Perú SA shipyard is a complementary and strategic part of a maritime terminal. It is the fundamental element of security offered by the port, mainly due to the economic base that enables support of commercial maritime activity. Its development has a significant impact in both a direct and indirect way, with the final costs of internationally tradable products. Any economic strategy to diversify exports and/or less expensive imports, must account for the environment of their organization regarding the commercial ports. It is necessary that the port remains efficient and effective in order to compete at a global trading level.

Increasing transport capacity and the need for repairs, in the shortest possible time, requires shipyards to have not only a modern installed capacity but also an agile organization that is able to meet the requirements of customers in the maritime sector. This will guarantee their development in optimal conditions and international competitiveness, making ports not only a world trade destination but also the shipyard as an international service center in the eastern South Pacific. This can be achieved by the implementation of a Panamax-sized dry dock. This is the chosen solution for SIMA-Perú SA. The increase of capacity through this Panamax-sized dry dock will further boost the economic activity along the Callao port. The opportunity for Peru to become globally competitive is an excellent movement for the entire country.

There are four main reasons why the chosen solution is superior to the alternatives, this translates into positive impacts not only for the company but for the whole country. Building a new dry dock has the potential to have a greater and more immediate impact for SIMA-Perú SA and the surrounding economy than the alternative solutions. As the company is state-owned it is crucial that the solution addresses the priorities of the government of Peru as well as clearly demonstrate how these priorities can be achieved through aligning the

objectives of the state and SIMA-Perú SA so a synergy can be created. Thus, it is imperative that the solution reveals the economic and social impact that expanding SIMA-Perú SA operations in the port of Callao could have on increasing economic growth and addressing the social issues that currently exist. In addition, advances in technology require that the company update its operations to close the gap between its current capacity and the opportunity to work on vessels that are more modern in the most efficient manner in order to be competitive in its industry.

7.1. Political Impact

The construction of a new dry dock in the Callao branch of SIMA-Perú SA supports the objectives of the newly elected president, Pedro Pablo Kuczynski. According to his governance plan there are several objectives that he intends to achieve for the country between 2016 and 2021. Investing in the construction of a new dry dock in the Port of Callao could be a feasible way of realizing these initiatives.

For instance, one of the Governments objectives is to increase the competitiveness of foreign trade (Peruanos por el Cambio, 2016). Up until now, large investments have been made for the modernization and expansion of the port of Callao, nowadays this port is privately operated and considered a hub for international cargo ships since they have all the facilities for performing their activities. Building a dry dock in the SIMA-Perú SA's Callao operation center would enable the organization to offer maintenance services to these vessels. The dry dock would be a complement feature that would help position the port of Callao as a strategic partner of shipping companies. In the long term, the cargo companies could seek setting up their operation centers in Callao, attracting new investments and making the industry more dynamic.

Another point in the governance plan is related to the consolidation of the national defense which includes the modernization of the Peruvian armed forces (Peruanos por el

Kambio, 2016). SIMA-Perú SA is partnered with the Peruvian Navy and through this alliance the company could use the new dry dock for providing improved service. With the modernization of the armed forces, the Peruvian Navy most likely will likely purchase more and larger vessels which will need customization and maintenance. It would be necessary for SIMA-Perú SA to be able to receive these type of ships in their facilities, otherwise this lack of infrastructure would have a direct impact on the government's ability to achieve this goal.

Another example of a potential synergy between the objectives of the government and the construction of a new dry dock is related to education. The government gain knowledge and learn best practices from industry specialists and other countries (Peruanos por el Kambio, 2016). The dry dock would present an opportunity for generating an interchange of knowledge. For example, since a foreign contractor would be selected to develop the dry dock, Peruvian engineers and SIMA-Perú SA's staff would have exposure to advanced skills.

Expanding SIMA-Perú SA operations by constructing a new dry dock has clear synergies with government objectives, the project will have the support from the state at all levels because it would become a matter of national interest.

7.2. Social Impact

Building a new dry dock for Panamax type ships has the potential to create a sustainable social impact for Peru. Its construction would not only create many new jobs but also increase global awareness about Peruvian products. Peruvian product recognition could lead to further social developments and at the same time help the government to fulfill its social change promises.

Job creation is the first social incentive for building a new dry dock. The construction would require non-skilled and skilled labor, design and planning would require engineers and technicians, and the project management would require experienced managers. Furthermore, the future operation of the dry dock will provide jobs for talented persons from

marketing, logistics, technology, accounting and finance fields. Job creation contributes to a higher quality of life and a stable social environment. The unemployment rate in Peru is increasing. It was reported to be 7% in June 2016, up from 5.7% at the end of 2015 (Trading Economics, 2016). If the project is commenced, it will absorb a huge labor force and decrease the unemployment rate.

With an increase in job opportunities, individuals become motivated to develop knowledge and skill mainly through education. SIMA-Perú SA offers jobs to students through internship programs. This opportunity can be expanded with the creation of more positions not only for the construction of the dry dock but for the operation of it. In order to cultivate competitive students, schools will have to promote their programs and develop their curriculums to adapt to the number and type of jobs available. The jobs created by constructing a new dry dock and its future operations will strengthen the national education programs and improve the level of educated persons.

The presence of a new Panamax dry dock, between Panama and Chile, will attract more traffic to Peru. The increased number of incoming ships would promise secured demand for SIMA-Perú SA maintenance services. Also, having more foreign representatives entering Peru, presents an opportunity for increased exposure of Peruvian products. This could lead to increased export of Peruvian products as well as importation of new foreign products. Peru has so much to offer in terms of its products, services and culture. The expansion of SIMA-Perú SA's operations could open a window for Peru to further advertise itself on the global stage.

By increasing international commerce and strengthening Peruvian brands, the Kuczynski government would be able to fulfill its commitment to increasing the competitiveness of foreign trade (Peruanos por el Kambio, 2016). Also, the profits generated from the operation of the dry dock could enable the government to launch social welfare

initiatives and improve public resources, contributing to a harmonious and stable society. In return, the government will gain citizens' satisfaction, trust and support.

7.3. Economic Impact

The expansion of SIMA-Perú SA operations, in the Port of Callao, has the potential to lead to increased economic development in Peru and competitive advantages in the social and economic spheres. Ports have historically been a center of economic development for the surrounding area by creating new quality jobs, sparking the development of industrial tourism, identity of the population to port activity, creating carriers and logistics networks associated with the Port, urban economic benefits for the city, and improving the quality of life of inhabitants.

By linking countries, Ports increase trade, GDP, and production and consumerism of global markets. They are typically combined transport centers with multifunctional commercial and industrial areas where ships are maintained and serviced, and goods in transit could also be manipulated and manufactured and distributed. These value-adding activities is where port cities develop much of their social economic capacity. For example, the Port of Valparaiso in Chile, developed a proposal to encourage investment to improve the Ports existing capacity in the hope that it would lead to more efficient service, in part by attracting larger, more modern ships. The proposal was accepted and the subsequent investment in modern docks and new berths attracted larger and more modern ships and enhanced service quality by reducing waiting and service times. These positive results have brought economic benefits to the country and reasonable returns to Chile's treasury (World Bank, n.d.).

It should be noted that on the one hand, cities may benefit socially and economically from being identified as port cities, but on the other hand ports may also have a negative environmental and social impact. For example, traffic congestion, air quality, noise, light pollution and security issues. When considering expanding the capacity of a port, measures

need to be taken to find a balance in order to mitigate damaging environmental effects and growing concerns regarding environmental issues such as global warming.

7.4. Technological Impact

Once the port of Callao becomes more attractive to international business, technological advancement happens on two different levels. First, SIMA-Perú SA will enhance its own expertise in a variety of key-fields. Similar to the expertise that the company will gain from ThyssenKrupp and Elbit in the recent efforts to modernize German submarines in Lima. In this example, ThyssenKrupp has unique knowledge about separating submarines into two parts, enabling SIMA-Perú SA to modernize the inside and maintain the ability to reconstruct. In order to build a dry dock, the company will have to collaborate with or contract an outside party to fulfill the job. With this venture, the company can gain valuable knowledge and experience.

A second technological advancement is necessity driven. If the port of Callao gains more relevance, more companies in Lima and Peru will be challenged to increase technological advancement in order to reach international standards. The Panama Canal is an example of how an international opportunity drove technological advancement into a country which was previously a developing country. In a similar way, the port of Callao could attract foreign investors, becoming an international hub for trade.

Chapter VIII: Implementation Plan & Key Success Factors

In this chapter, the plan for developing the proposed solution is outlined. Each activity that needs to be done for implementing the solution is described. Additionally, the key success factors of this project are determined in order to guarantee a smooth implementation of the new dry dock.

8.1. Activities

In order to build the new dry dock in the Callao operation center of SIMA-Perú SA, there are some steps that need to be followed. Some of these involves government procedures that are required for getting the approval for this type of investment. The following activities has been defined for implementing the proposed solution.

8.1.1. Conduct a feasibility study including market research

This activity has a duration of 8 months. Within this report, the importance of an efficient feasibility study is demonstrated. This includes allocating a short duration of time for the study. An allocation of six months is appropriate to conduct a proper feasibility study. As no quantitative numbers have been previously provided, it is crucial to determine the financial impact that constructing a new dry dock will have. Market research has been briefly explained within this report, however a larger emphasis on traffic and flow of Panamax and Post-Panamax ships needs to be examined in order to determine factors such as time of entry, and the magnitude of the potential market.

8.1.2. Compose a proposal for government

This activity has a duration of 6 months. In order to receive funding from the government SIMA-Perú SA must create a proposal highlighting all of the positive impacts that increased capacity, through the use of a Panamax dry dock, will have on Peru. As previously mentioned, the government places priority on funding private sector work as they feel it boosts the economy.

In order to appeal to the government, SIMA-Perú SA must demonstrate the social impact this project will have. The proposal needs to highlight how many jobs will be created, the increased traffic along the port will increase exposure to Peruvian products, the advancement of international commerce in Peru, and the opportunity for SIMA-Perú SA to profit. It is crucial to note the importance of creating Peruvian product recognition as this will profitable and sustainable economy.

It is anticipated that the creation of the proposal will take 6 months to complete. With the government proposal and market research, all the information regarding social and economic benefits would be available. It is crucial that SIMA-Perú SA demonstrates all of these benefits for the country when seeking the government approval for receiving the funding as it is important for the decision makers to see the potential benefits of the construction of a new dry dock.

8.1.3. Gain approval from FONAFE

This activity has a duration of 6 months. SIMA-Perú SA must obtain approval from FONAFE for all activities within the company. Annually, they must disclose revenues, upcoming budget, future plans, and seek approval for new projects. This includes the disclosure and approval of the project for the construction of the dry dock. However, before this step, the proposal to the government must be approved so that SIMA-Perú SA can provide funding information to FONAFE.

It is estimated that obtaining the approval from FONAFE for the development of the project take approximately 6 months to process due to the company's previous experience with FONAFE. Because SIMA-Perú SA is state-owned, ample paperwork must be provided and processed, which takes a relatively long time. Also, FONAFE controls and oversees multiple projects at once, resulting in a bottleneck and increased time to review and approve cases.

8.1.4. Develop final feasibility study and technical file

This activity has duration of 18 months. Once all information has been gathered, a final study along with a technical file of how the project will be constructed, must be created. This will take an approximately 18 months to compose. This report is expected to take quite some time due to the necessity of strong quantitative data. This file includes FONAFE's approval, the government proposal and approval, and all required information for the implementation of the project.

8.1.5. Open bidding for international construction contractors

This activity has a duration of 6 months. This is a crucial step in the implementation plan of increasing SIMA-Perú SA capacity for receiving larger ships in the Callao operations center. Once the project has been approved by the stakeholders, SIMA-Perú SA needs to open a bidding war for specialized international contractors who are interested in constructing the dry dock in Callao. SIMA-Perú SA needs to open the bidding war by first clearly stating the type of contract that bidders will enter into and all the technical specifications that need to be fulfilled. The creation of this contract will take approximately four months, leaving time for legal approval and proper budget allocation.

As this is a special project, it is likely that the bank (or funder of contractors) will require a turnkey contract that demonstrates the specific designs and engineering (World Bank, 2016). These designs, created by contractors, take approximately another two months to complete. Another requirement by the company is a letter of guarantee from the contractor in order to secure the fulfillment of the agreed conditions. Once all international bids have been accounted for, SIMA-Perú SA must decide which will be the most cost effective. This choice is based on factors such as cost, time required, country affiliations, and approval by FONAFE. The government also needs to approve the contractor because of the budget allocated, along with FONAFE who determines if the contractor aligns with all requirements.

8.1.6. Approve the contractor, evaluate and select

This activity has a duration of three months. SIMA-Perú SA, FONAFE, and the government must all approve the selected contractor. The company should originally select a contractor that obliges to all requirements for shortening the duration. As mentioned previously, there is a set of criteria that guides the selection of contractors in public investment projects.

8.1.7. Move naval base

This activity has a duration of 6 months. SIMA-Perú SA does not currently have the rights to land to implement a dry dock in the shipyard, the current available area is not big enough. In order for a new dry dock to be built, the naval base needs to be relocated to a different section of the property. The dry dock will be located where the naval base currently is because of its size and accessibility. It will take approximately six months to move the naval base and arrange the shipyard.

8.1.8. Construction of dry dock

This activity has a duration of 24 months. The final step of the implementation plan includes the construction of the dry dock. After all required approvals have been conducted, the construction of the Panamax-sized dry dock can begin. The construction has four main steps; area clearance, sinking strip drains, capping beam and sidewalls, and reinforcing concrete floor (Soletanche Bachy, 2001). Once the construction has been completed and the structure has been tested, it will be open for use.

8.2. Implementation Gantt Chart

Figure 7 shows a Gantt chart considering the activities that were described. It is important to mention that the moving of the naval base is a parallel activity that can be executed at the same time with another. The estimated investment for this project is 200 million USD (“El Astillero SIMA,” 2013).

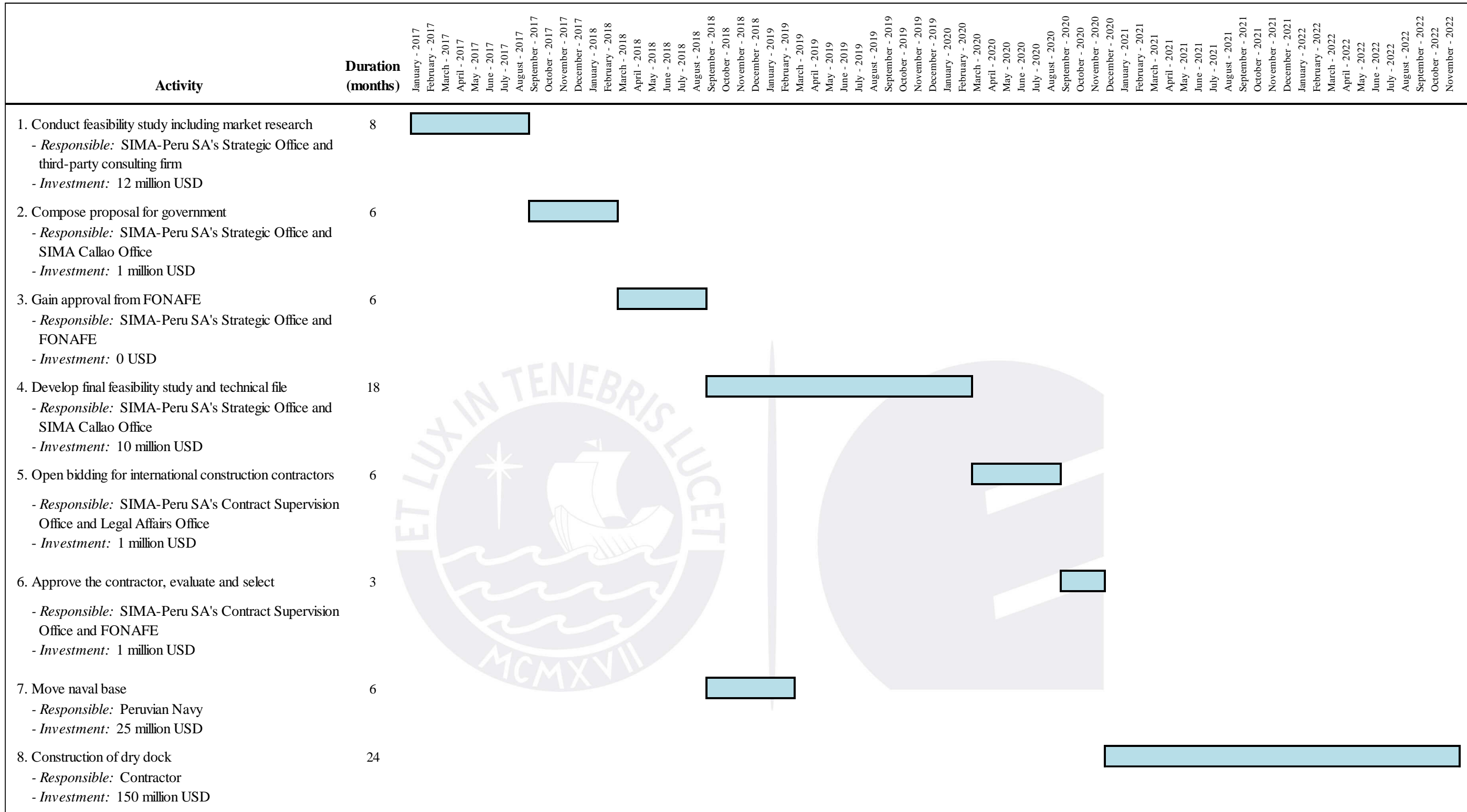


Figure 7. Gantt chart for the implementation of the proposed solution

8.3. Key Success Factors

The key success factors for the implementation of the proposed solution have been identified through an analysis of the enablers and risks of the project. This analysis consists in considering two possible scenarios, an optimist one and a pessimist one. Based on these two potential realities, some factors are identified in which the positive or negative outcome depend on. For each of these factors, the ways to ensure them or avoid them are also determined.

8.3.1. Government approval for funding

Enabler: The financial support from the government is fundamental for building a dry dock. The government's approval of SIMA-Perú SA's project and FONAFE funding grant is crucial for the execution of the solution.

How to ensure: In order to receive government funding successfully, SIMA-Perú SA has to make a comprehensive proposal which addresses the opportunity and demand, barriers to fulfilling this need and the process of building the dry dock, including its feasibility. More importantly the proposal must demonstrate the social impact and the economic benefit of the project for Peru.

Risk: SIMA-Perú S.A faces the risk of the proposal being disapproved by the government and not receiving funding from FONAFE. It is also possible that the company is not granted the amount which they request, putting SIMA-Perú SA in a dilemma.

Furthermore, the government may reduce funding during the construction phase due to other project investment or an emergency. An internal risk also exists because SIMA-Perú SA may not be able to manage the funds properly and waste financial resources.

How to avoid: SIMA-Perú SA needs to provide a comprehensive proposal to the government and react appropriately to answer the government's doubts. In order to prove the feasibility of the plan, SIMA-Perú SA will have a detailed and precise budget plan for each

stage of the project. One of the contracts will have to define the terms of the budget, for example scheduled installments from FONAFE.

8.3.2. Land availability

Enabler: Having available land in the Port of Callao, to build the Panamax dry dock, is vital for the project. This will require government approval to relocate the naval base and grant the land to SIMA-Perú SA

How to ensure: SIMA-Perú SA must fully describe the positive impact that the project will have for the whole country and prove the feasibility of the plan. To persuade the Peruvian Navy to relocate, SIMA-Perú SA needs to build and maintain a strong relationship with the Navy and demonstrate the benefits of relocating the Navy base for the company, the Navy and the country.

Risk: SIMA-Perú SA may not be granted government approval to have rights to the land where the Navy is currently located. Another risk is that the Navy may not be willing to relocate because of other project that that entity may have for future development or the government cannot find a suitable place for the Navy's relocation.

How to avoid: Having a larger area with better facilities for SIMA-Perú SA operations is an incentive to relocate the Navy. The Navy will be satisfied on the condition that they also benefit from improvement is SIMA-Perú SA infrastructure. In order to ensure the Navy's cooperation, SIMA-Perú SA needs to outline the benefits to the relocation and participate in finding a new location that is suitable. In addition, SIMA-Perú SA can assist with the relocation process by offering assistance in the removal, transport and construction of existing and new naval equipment and facilities.

8.3.3. Skilled human resources

Enabler: SIMA-Perú SA and FONAFE who select and approve the contractor to construct the new dry dock.

How to ensure: Core competence building, externally and internally, is essential to the successful implementation of the solution. To complete the construction of the new dry dock it is critical that a contractor who is qualified and experienced, in building dry docks of this type, is selected to take on full responsibility for the project, risk for price, quality and timely performance. The primary contractor must have access to skilled labor to sub-contract the different elements of construction (e.g. engineering, framing, metalwork, electrical, etc.). In addition, all of the contracted workers will have to have access to the appropriate equipment, tools and technology in order to build the dry dock. All of this will be ensured through a detailed selection process of the appropriate candidate.

Risk: One of the potential risks is that contractors with the best reputations, relevant experience, and high quality standards may be pre-occupied with other projects. In addition, the most suitable contractors may be more attracted to other projects that will generate more revenue for them. In addition, the equipment required to build a dry dock may not be in the possession of the selected contractor or readily available which could result in delays for the project.

How to avoid: In order to mitigate the risk of being unable to secure the most suitable contractor it is critical that SIMA-Perú SA provide all eligible prospective bidders with timely and adequate notification of the project requirements and an equal opportunity to bid. All bids and combinations of bids should be received by the same deadline, and opened and evaluated simultaneously to determine the bid or combination of bids offering the lowest evaluated cost. It should be noted that cost should not be the sole deciding factor, rather contractor selection should consider other factors such as previous experience with similar projects, quality standards, reputation and references. Once the contractor is selected the terms of the contract (roles, responsibilities, terms of payment, risk management, etc.) need to be finalized and agreed upon by all parties.

8.3.4. Technology

Enabler: SIMA-Perú SA's assessment of technology need and ability to use technology once it is in place, Government and FONAFE approval of appropriate funding to purchase technology, supplier availability of technology, and accessibility of technology and equipment for the contractor.

How to ensure: Technology is critical to the construction of the new dry dock. It is also necessary that it is incorporated into the new infrastructure as it adds value to the ship maintenance and repair services. It is critical that SIMA-Perú SA encourage, support and promote the introduction of new technologies in the exploitation of port services and in order to be competitive in the Panamax market.

The appropriate technologies must be available at the time of construction to improve efficiency and lower costs of building a dry dock. The cost of implementing new technologies is high and adequate training plans are necessary to support technological changes within an organization. It is imperative that workers are trained on how to use these technologies. Ultimately training, degree of usage and the resulting benefits of using technologies is critical to the successful implementation of expanding the capacity of SIMA-Perú SA.

Risk: There are several factors which threaten the successful implementation and use of technology. The required technology must be available to the contractors and there must be sufficient budget available. Because the shipping industry is rather specialized and modern equipment is technologically advanced (e.g. robotics and automated machinery) there is a risk that the bargaining power of suppliers may be higher than expected. Also, human resources must be able to use the technology effectively and be motivated to do so.

How to avoid risk: In order to mitigate the previously mentioned risks SIMA-Perú SA and the selected contractor(s) must have accurate knowledge regarding technology and

equipment costs prior to the funding request and contract agreement. Research must be performed before selecting technology suppliers, and effort must be made to develop relationships and terms of negotiation. With the introduction of new technologies there needs to be adequate education and training programs for workers to keep productivity and motivation high.



Chapter IX: Expected Outcomes

The increased capacity to handle more maintenance and repairs of ships will cause a ripple effect on the business environment in Lima, Peru. The port of Callao is expected to grow substantially due to a higher attractiveness for ships to complete maintenance and repairs at SIMA-Perú SA. Job creation, increased knowledge, and technology advancements will increase the standard of living in Peru. The project has high aspirations to help the country advance, similar to the way that the Panama Canal helped Panama become a stable and developed country. Four and a half years after the implementation starts, approximately 300 people would be employed for the construction of the new dry dock (“Cochin Shipyard Cleared,” 2016).

Capturing more contracts will certainly increase the profits of SIMA-Perú SA. The increased capacity will enable the company to take on more projects and gain more clients. Especially in the sector of maintenance, the profit margins are more lucrative. With the construction of a new dry dock, SIMA-Perú SA will be able to expand their operations, and develop and demonstrate their business capabilities.

The expected outcome of the project is to help Peru on a social, economic, and technological level. The project aligns with several of the new government’s goals, including job creation, increasing the competitiveness of foreign trade, consolidating the national defense which includes the modernization of the Peruvian armed forces, improving education levels and addressing the wealth disparity. Following the economics theory, the Keynesian Multiplier supports the fact that public investments and expenditures have a multiplier effect in the country’s GDP. According to Julio Velarde, president of the Banco Central de Reserva, the multiplier index for Peru is 1.5 (“Banco Central del Perú afirma,” 2016). Having stated this, if the estimated investment is 200 million USD, then the complete effect would be for 300 million USD. According to the World Bank (2016), Peru’s GDP is 191 billion USD.

With these information, the impact of the investment in the GDP can be estimated as 0.16%.

The expansion of SIMA-Perú SA operations with the construction of a new dry dock could have a profound social impact and improve Peru's economic situation in the long term.

Ultimately the desired outcome is that the project will have a substantial impact on the welfare of the citizens of Peru and create value for the country as a whole.



Chapter X: Conclusions and Recommendations

10.1. Conclusions

The use of tools for the external and internal analyses were an important step in the diagnosis of the company, which led to the further identification of opportunities, weaknesses, strengths and threats. Specifically, the PESTEL and the Porter's Five Forces methodologies served as a guide for evaluating each aspect of the external environment in which the company develops its activities. The AMOFHIT framework was crucial for assessing the current situation inside the company. A deep understanding of both the situation inside and outside the organization created the appropriate environment for the acknowledgment of the issues that the company faces. From this holistic perspective, how and the magnitude to which some of these factors negatively impact company operations was made clear. For instance, the high automation of processes of the competitors was identified as one of the main threats for SIMA-Perú SA. The strategic location of the Callao operations center next to the commercial port is the most important strength of the company.

The literature review allowed determining the complexity of the problem solving process which consists in a logical set of steps, each of these has specific techniques that can be applied in order to solve the problem effectively. For companies it is important to conduct regular analysis in order to verify the existence of potential problems and solve them before they evolve into situations that are more difficult. The literature reviewed also showed how the operations management can become a source of strategic advantage for a company because it shapes the flexibility of a company to respond to market changes. In addition, capacity planning is emphasized as a decisive factor that can restrict or boost future growth in a company.

A better understanding of an identified problem was achieved by using the framework that evaluates the location, ownership, magnitude and time of the issue. The location element

consisted of identifying which areas of the company the problem is localized. Ownership of the problem focused on determining which areas of the company are most affected and the actors involved in the problem as well as those in a possible solution. Defining the magnitude of the problem required an examination of who, directly and indirectly, is affected by the problem. In this case the problem is that an opportunity has not been captured, which means that by not taking action more than just the company is effected and so the magnitude is much greater than one would assume. The time that the problem has existed for was determined from around the time that Panamax ships emerged on the market, in the 1960's, and their increasing prevalence ever since. Thus, the opportunity to service Panamax ships has existed for quite some time. Using this approach allowed for a deeper analysis of the problem and its implications within the company and for Peru.

The thorough identification of causes was achieved using the cause-effect diagram, which is a visual problem solving tool. This tool allowed the analysis of causes which related to different aspects of the problem, ranging from management to infrastructure. Through this framework, several causes were listed and using the Five Whys methodology, the main causes were identified. The most important cause that was identified for the defined problem of SIMA-Perú SA is the inadequate facilities of the company which limits its capability to service larger ships like the Panamax or Post-Panamax.

Taking into consideration the identified root causes, three alternative solutions were proposed for solving the problem, each of them was focused into in a specific aspect of the problem. One of them was about updating old equipment which would impact into reducing attention times so more ships could be maintained. Another one was regarding investing in market research which would allow the company to obtain a clearer panorama of market trends and opportunities so better options for investment can be seized. The other alternative solution was to build a new dry dock, this will enable the company to give services to larger

ships. After an assessment of the three alternative solutions, building a new dry dock was selected as the one that would have the bigger impact in the main cause of the problem which is the inadequate facilities of the company.

The proposed solution has different impacts inside and outside the company. Regarding the political aspects, this project is aligned with different objectives that were established by the Pedro Pablo Kuczynski's Government like the modernization of the national defense or the increasing of the competitiveness of the international commerce. The solution also has social impact because it will positively affect the neighboring communities of the port of Callao and will generate jobs for skilled and non-skilled labor. An increase in the GDP of 0.16% will occur due to the investments of this project. Knowledge transfer from international professionals that would carry the construction will happen to SIMA-Perú SA staff.

The examination of enablers and risks for the implementation of the proposed solution helped determine the key success factors of the solution, which mitigate risks and guarantees a successful implementation. The first key success factor is that the Government approves the proposal and FONAFE grants funding. In order to ensure this, it is recommended that SIMA-Perú SA provide a comprehensive proposal addressing all necessary points especially the social impact of expanding the port of Callao immediately and for the long-term future of Peru. With regard to funding, it is recommended that scheduled planning of installments is made between SIMA-Perú SA and FONAFE. Land availability is the second key success factor to consider. In order to obtain rights to the land to build a new dry dock, the company must fully describe the positive impact that the project will have for the whole country to persuade the government and assist in the relocation of the Navy. Skilled human resource is vital for the whole process of building a dry dock, and its successful operation following its construction. SIMA-Perú SA along with the government and FONAFE is responsible for

selecting a qualified and experienced contractor, as well as make sure that the labor force undertakes the project in time and cost efficient manner. Lastly, adaptation to technological advancements in the industry is necessary. It is critical that the company introduces current technology and equipment and provides training programs for employees to make sure the technology is utilized to its full capacity.

10.2. Recommendations

SIMA-Perú must invest resources in quantifying the social impacts of the proposed solution. For example, how many jobs would be created by implementing the solution, and how this will affect issues of unemployment, poverty and wealth disparity during the initial phases of the project and in the long-term. With an increase in job opportunities, the education program in public schools or private institutions is encouraged to develop their curriculums to cultivate competitive education. This would strengthen the national education programs and improve the level of educated persons. On the other hand, the presence of a new Panama dry dock will improve the international trading in and out of Peru. It would enable Peru to widely advertise its products, services, and culture which will accelerate the globalization process in Peru. By adapting to trends in globalization by expanding the country's largest port and commercial hub, the government would effectively demonstrate its commitment to increase the competitiveness of foreign trade. In return, the government will achieve citizen's satisfaction, trust, and support.

For SIMA-Perú SA to go further with this project, it is required to conduct a more thorough market study concerning the potential demand of services for larger vessels. SIMA-Perú SA must carry out market research to gain an economic overview and identify business opportunities. It is necessary to research the number of Panamax type ships passing by the port of Callao and quantify the need for maintenance service. In addition, SIMA-Perú SA needs to collect data in terms of the competition, specifically pricing and the service that their

competitors provide. By analyzing this information, SIMA-Perú SA will be able to define the potential profits and the feasibility of the project.

Although the proposed solution is the construction of a new dry dock, it is important to start planning investments for market studies. This will allow the company to work on long-term development plans. Information about the market will provide more insights into the future demand of repairs and maintenance. This information will provide SIMA-Perú SA with more knowledge about their competitor's strategies, positioning, and competitive advantages, as well as reveal market trends which might be shifting in the future.

It is recommended that the company make a proposal to FONAFE to allocate money annually specifically for research and development activities in the company. Increased activity in research and development would help SIMA-Perú SA stay current with modern equipment and work with the best tools that are available, which could lead to a competitive advantage. Although the immediate returns are not visible, the company can benefit greatly by using research and development to improve their product/service offering and to meet unmet demands in the future.

Human resources development is a large aspect of the company that still needs to be improved. The existence of talent management programs is required so employees can feel motivated towards recognition and promotions. People are at the core of every company. Too many administrative employees can make an organization overly bureaucratic and negatively affect productivity. Employees have to be hired and retained at the positions that are needed most and that contribute to the company's sustainability and growth. With such a high average age of employees (55 years), it is necessary that SIMA-Perú SA implement training programs for these employees so that they can effectively use the latest technology and machinery. The high average age also puts the company at risk of losing the knowledge and experience that it has acquired over the years. This could be avoided by implementing cross-

training or mentorship programs which would pair up new younger employees with those that are older and more experienced.



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