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Development of Risk Management Model in Maritime Industry

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Abstract

Sea transportation is a sector that is closely related to the livelihoods of many people, where sea transportation has a vital role in its relationship with other sectors in improving the welfare of the community. Besides that, the sea transportation sector plays a vital role as a means for the development of the maritime industry in meeting basic needs, namely accessibility for an irreplaceable society. The maritime industry engaged in the shipping industry is a regulatory intensive industry. Business activities The maritime industry involves many stakeholders including flag states, ship owners, ship operators, coastal states, cargo owners, shipyards, shipyards and ship crew. Apart from being so, this regulation is dynamic, vulnerable to change in order to answer and adjust the times and demands of society. The purpose of this paper is to develop a risk management model in managing the maritime industry. Changes to maritime regulations discussed are changes in regulations source from mandatory IMOs on major international conventions including SOLAS on ship safety, MARPOL with regard to the environment and STCW with regard to ship crews. Risk assessment is conducted to determine the level of risk and mitigate risks from regulatory changes.

Keywords: maritime industry; process management risk; shipping industry; IMO, SOLAS, MARPOL.

1. Introduction

Today's maritime development is very influential on global economic growth which indirectly drives industry and trade to increase over time. The majority of world trade commodities that move from one country to another include shipping transportation (International Chamber of Shipping, 2015). The volume of world commodity trade which increasing every year is one of the triggers for the increasing volume of world trade transported by sea. Along with the development of the times, the demand for quality, safety, environment and security of sea transportation has also increased (Ragazzi et al., 2017). The shipping industry plays a very important role in world commodity trade. However, shipping is an industry full of changes in regulations with IMO as an international body that shelves it. Changes in maritime regulation are international agreements aimed at increasing the level of safety and prevention of environmental pollution. The emergence of changes or additions to maritime regulation is closely related to major events. The event of the sinking of the Titanic in 1912 became the forerunner of the birth of the international convention SOLAS (Safety of Life at Sea) in 1914. SOLAS is considered the most important international convention of other conventions especially those related to safety (IMO, 2016). However, along with the growth of the shipping industry in the 1960s, a new problem arose, namely the spill of 120,000 tons of oil known as the Torrey Canyon event in 1967. In response to this event, IMO issued an international convention that regulates pollution prevention against environment, namely MARPOL 73/78. But a few years later in March 5 1978, the Exxon Valdez incident that ran aground in the waters of Alaska Prince William Sound also caused a spill of 10 million gallons of crude oil and polluted the sea. This event became the forerunner to the birth of a double hull regulation. This regulation requires that all vessels measuring more than 5000 DWT have a double hull construction. Several years later, namely in the

1990s IMO also issued a regulation governing ship safety management, namely the ISM Code. The September 11, 2001 terrorist attacks also became the forerunner to the birth of regulations on security at the port, namely ISPS Code. The ISPS Code became mandatory and amended under the SOLAS convention in 2002. In the past 26 years IMO has issued many maritime regulations and it cannot be denied that regulatory changes have an impact on decreasing the rate of ship accidents (Eliopoulou & Papanikolaou, 2007). The large number of regulatory changes or the number of additional regulations pose a risk, especially when regulation is considered excessive and that also means increasing costs for a small and limited benefit. (Viertola & Storgard, 2013).

For ship owners or ship operators to be able to do business well, expect that they can carry out business activities in a stable regulatory environment (Karahalios, 2015). This is very reasonable so that business activities carried out have certainty and do not experience turbulence due to changes in regulation. Research conducted by (Knapp & Franses, 2009) shows that maritime regulation issued by IMO in the period 1912-2006. Some previous studies have stated that the maritime industry is over regulated and is the industry that has the most regulations (Karahalios 2015; Alderton & Leggate 2005) when compared to other industries although many agree that IMO can improve safety standards in the sea with apply these regulations. However, regulatory changes have resulted in additional costs for ship owners or operators. These costs are included in the implementation costs to meet regulatory requirements. As a result, shipowners will usually face a conflict of interest between consumers and their market share. The shipping industry requires more capital budget due to aging of the fleet and the higher requirements for ship safety standards (Albertijn et al., 2011). Therefore, it can be said that the willingness of ship owners to implement regulatory changes depends on the benefits and benefits that can be achieved. (Karahalios, 2015).

The maritime industry is a complex industry and consists of many actors that are interrelated with each other. According to Karahalios (2015) the stakeholders in the maritime industry include flag state, coastal state, classification society, P & I Club, ship operator, insurance, marine consultant, shipyard and cargo owner. This paper aims to develop a risk management model in the management of the maritime industry by linking various changes in maritime regulations sourced from mandatory IMOs to major international conventions including SOLAS on ship safety, MARPOL relating to the environment and STCW relating to the crew ship.

2. Development of Global Business and Maritime Industry

In the industrial sector, risk assessment has become a common thing. The shipping industry is growing very rapidly and is able to facilitate transportation of supply and demand of world commodities such as basic materials, industrial materials, finished products and even in meeting transportation needs for passengers, vehicles and livestock. World economic growth is strongly influenced by shipping industry. This growth is proportional to the rate of growth in the number of ships, ship size and more efficient ship design. This growth rate is caused by several factors. The first factor is the discovery of new mineral sources in all parts of the world, this greatly affects the increasing volume of cargo traded. The second factor is the advancement of technology and the development of increasingly advanced vessels resulting in faster and more efficient delivery times. The last is the increasingly consumptive lifestyle of society which results in an increase in the number of requests for goods and services. Cargo transported can be classified into several types, namely, liquid bulk, dry bulk, general cargo, container cargo. There are also types of cargo that require special handling, including natural gas, refrigerated cargoes, automobiles, forest products and livestock.

In the shipping industry, shipowners agree to charters. The agreement was signed on a cooperation contract. The cooperation contract depends on the need for how long the ship tenant uses the service to deliver the cargo. The types of cooperation contracts in shipping tankers consist of five types, namely Voyage Charter contracts, Contract of Affreightment (CoA), Trip-Charter contracts, Time-Charter contracts and Bareboat or demise Charter contracts. Before signing a cooperation contract, both parties negotiate first, the negotiation method can be directly or through a broker. In the cooperation contract contains the duration of 40 boat rentals, the type and number of cargo to be transported, the payment method and the most important is freight. The amount of freight paid is usually calculated according to the amount of cargo (USD/ton) or boat rental per day (USD/day).

3. Maritime Regulation

Maritime regulation is one of the products produced by regulators that are under the supervision of the United Nations. In 1982 the UN issued the UNCLOS 1982 convention (United Nations on the Law of the Sea) which became the embryo of the birth of IMO (International Maritime Organizations) and ILO (International Labor Organizations). IMO has the task of regulating safety and prevention of marine pollution by ships, while the ILO issues regulations on workers on board. These two organizations issued an international convention which would subsequently be determined whether it would apply as an international regulation or not all depends on 166 member countries when approving the convention. Some key statutes in the maritime industry are SOLAS, MARPOL and ISM Code. Safety of Life at Sea (SOLAS) is a statutory issued by IMO to regulate safety regulations at sea. The safety regulations aim to

improve the safety of ship crews, passengers and ships. All countries including IMO members must adopt SOLAS for ships with the state flag. SOLAS consists of 12 chapters. SOLAS is a very important provision, perhaps even the most important because it deals with the safety of merchant ships and also the oldest. In the first version it was approved by 13 countries in 1914, namely after the events of the sinking of the Titanic in 1912.

Marine Pollution (MARPOL) is a statutory issued by IMO to regulate pollution and pollution that occurs in the sea by ships. This regulation contains requirements, procedures and equipment that must be owned by the ship in order to prevent pollution and pollution in the sea by the ship. Apart from the rules and statutory above, IMO also issued many other rules called code. The code contains practical standards and international implementation to organize a field more specifically. An example is a Code that has been issued by IMO is the ISM Code and ISPS Code. International Safety Management (ISM) Code is an international standard of safety management in ship operations and efforts to prevent/control environmental pollution in accordance with the awareness of the importance of human factors and the need to improve ship operational management in preventing ship, human, cargo/property and property accidents. and preventing pollution of the marine environment, IMO issued a regulation on ship safety management & protection of the marine environment known as the International Safety Management (ISM Code) which was also consolidated in SOLAS.

Basically, the Code uses a risk management approach to ensure the safety of ships and port facilities and, to determine what security measures are appropriate, risk assessment must be carried out in each particular case. The purpose of this Code is to provide a standard, consistent framework for evaluating risk, allowing the Government to compensate for changes in threats by changing the value of vulnerability in ships and port facilities through the determination of appropriate levels of security and appropriate security measures. All countries that adopt SOLAS must comply with the Code above.

SOLAS and MARPOL have become one of the biggest conventions that greatly impact the development of regulations in the maritime field. After the convention has been approved and signed and implemented, countries are obliged to ratify the convention and apply it in their countries. Countries that have ratified international conventions are commonly called maritime states. Maritime states have two functions, the first function is as flag states, functions as coastal states. For example, Indonesia as a flag state is responsible for all ships registered in the country (Indonesian flag), while functions as a coastal state, Indonesia serves as law enforcement for all ships sailing or anchoring in Indonesian waters. Another actor in the maritime industry is classification society. Each flag country generally has its own classification body. Classification bodies are bodies that issue technical advisers. IACS is the association of world class (non-governmental) bodies recognized by IMO and has functions to make technical procedures and implementation of statutes made by IMO.

In conducting ship surveys and inspections, the classification body assigns tasks to class surveyors who descend directly to the field to carry out inspections and surveys on ships, the oil & gas industry etc. In this case, a surveyor is required to understand the class requirements, rules of the class, and statutes that are agreed upon by IMO. Each classification body has standards that differ from one class to another. Bureau Veritas is a classification body that is a member of the IACS and recognized by its existence by IMO. Bureau Veritas has rules called BV rules. Rules are technical standards, also called guidelines used by a conveyor in conducting surveys and inspections. Ships that want to be certified by the classification body are required to follow the requirements contained in these rules. Rules include technical standards for shipbuilding, ship inspection, inspection procedures and others.

4. Business Perspective of Maritime Regulation

Shipping industry is a big and very important business. Its contribution to transportation and world trade greatly helped support the growth of the world economy. This is because transportation costs are much cheaper when compared to other transportation modes. At present shipping contributes to 90% of the world trade market (Albertijn et al. 2011). Ships are a very promising asset in this industry, in 2015 the cost of VLCC shipbuilding ranged from 96 million USD. While the cost of constructing new vessels for Aframax and Suezmax was 53 million USD and 65 million USD respectively. Moreover, annual income from shipping industry reaches 500 trillion USD per year from freight (rental/transportation costs), this value represents 5% of the total economic value of the world (Albertijn et al. 2011). This shows that the shipping industry has a huge impact on the global economy. However, shipping industry is also a very risky business. The risks in the shipping industry are all uncertainties that can cause potential business value and profit to decline. However, the problem is how to identify possible risks.

Shipowners, such as business actor in general, argue that regulations tend to conflict with their initial goals in business, namely to get profits from their investments (Stopford, 2009). Fayle in the 1930s put forward a paper containing that in their efforts to improve both safety standards and working standards for floating conditions, the Board of Trade often placed themselves, during the last quarter of the 19th century, at odds with shipowners. They are considered to hinder the development of the shipping industry by laying down hard-and-fast rules that apply even to all small minority industries, and hinder British Shipping in international trade, by imposing exemptions on some foreign ships, even in British ports.

Regulatory perspective related to shipping company, IMO and flag state. According to the ISM definition the company code is any other owner or organization or individual such as a manager (manager) or tenant of 51 empty vessels (bareboat charterer), who has accepted the responsibility of managing the ship for the ship owner and the party accepting the responsibility agreed to take over all the duties and responsibilities provided by the ISM Code. IMO (International Maritime Organization) is a world organization formed by the United Nations and has a function to deal with maritime issues (make regulations) and has almost all maritime countries in the world. The main objective of the IMO is to provide a means for collaboration among its member countries in making government regulations and their implementation technically that concern the international shipping world. In addition, it also encourages and provides facilities to its member countries to adopt the highest standards which can be implemented in matters relating to maritime safety, efficient navigation and prevention and supervision of marine pollution from ships. In carrying out its functions and duties IMO has issued several regulations in the maritime field including the IMO Conventions and IMO Codes. IMO Conventions are divided into three types, namely conventions on safety, conventions on Marine Pollution and Liability and Compensation.

In the context of Flag State, a ship is a unique part of a country, therefore all state regulations/laws whose flags are flown on the ship are valid on that ship and also for the captain, the crew working on the ship and passengers who on it. In addition to national regulations/laws from flag ship countries, if the vessel is located or sailing in international waters, international regulations/laws apply to that vessel. The management of the ship with the approval of the ship owner has the authority to determine which flag will be used on its ship or ships in its fleet (may use more than one flag, for example, one Indonesian-flagged ship, another Singapore or Panama flag and so on).

5. Risk Management in the Shipping Industry

Risk is an opportunity for loss or destruction. According to Sunaryo (2007), everyone is aware that the world is full of

uncertainty which causes risks which are detrimental to interested parties, especially the business world. The topic of risk management became prominent after many events that could not be anticipated and caused losses to the company. Every company must experience and bear risks, including business risks, workplace accidents, natural disasters, theft and bankruptcy. Today, making companies carry out a risk management process expects business decisions that have potential risks of less value and expect maximum profits. Here are some of the most common notions of risk:

- a) *Risk as a Hazard*
Most people assume that risk has the same meaning as hazard. In the context of safety, hazard can mean hazards that may occur to humans, damage to equipment or pollution to the environment.
- b) *Risk as a Chance of meeting with an unwelcome outcome*
Definition of risk that is also popular, namely, risk is all that can cause uncertainty or have a negative impact on the business. One example is investment decisions that do not diversify can be defined as risks.
- c) *Risk as Uncertain decision*
Risk definition can also be interpreted as something to express uncertainty in decision making. For example, an attacker who says "I will take the risk" means revealing that the decision to be taken by the speaker has the possibility of not being in accordance with the desired results.
- d) *Risk in the technical definition*
Ben-Azher (2008) explains the terminology of risk is the multiplication between the probability of failure and the impact of failure. Risk is the multiplication value between consequences and frequency. Consequences show how much impact is caused while frequency is how often or the chance of an unwanted event.

According to Darmawi (2006), risk management is related to the functions of other companies, including: accounting, finance, marketing, production, personnel, engineering and maintenance functions, because those parts create risks that have a significant impact. Business people cannot avoid the risk completely but can manage risk as a way to reduce the potential risk. Risk management is an interesting topic for research because there are many events that cause losses to the company (Popa & Gulie, 2018). Some of the advantages of implementing risk management can prevent companies from failing, risk management directly supports the increase in company profits, because profits can be increased by reducing expenses, risk management can contribute indirectly to company profits.

6. Impact Area of Maritime Regulation Changers

According to Leggate et al. (2005) that the impact of changes in maritime regulation can be classified according to the impact area. Impact area is a type of influence/impact caused by changes in maritime regulation. From the regulation change data, an analysis was carried out to determine the impact area. Impact area due to changes in maritime regulations consists of Ship Instruments (Ship Instrument/Construction), Ship Operations (Ship Operation), Ship Cargo (Ship Cargo), Crew (crew/person onboard), Environment (Environment), and Security (Security).

- a) *Ship Instruments*
Changes in maritime regulations are very closely related to changes in ship construction or the addition of tools (instruments) on ships. IMO issued several international conventions that regulate this matter, for example, SOLAS (International Convention for Safety of Life at Sea, 1974) requires minimum standards of ship construction strength and safety equipment such as fire suppression equipment, navigation equipment, safety equipment and radio equipment that must be on board. In addition, SOLAS also requires regular ship surveys and is approved by flag states by

¹ issuing a certificate of compliance. COLREG (Convention on International Regulation for Preventing Collision at Sea, 1972) regulates the requirements for the basics of shipping lines to avoid collisions between ships. Load Line (International Convention on Loadlines, 1966) regulates the minimum height of the ship's hull (freeboard) according to the shipping lane and season. The Classification Board also has its own standards which regulate the technical issues of ship design, construction and maintenance. Although not all regulations are mandatory, these changes in regulation are considered financial pressure for shipowners (Leggate et al., 2005).

b) *Ship Operations*

In the last few years ISM (The International Safety Management Code, 1993) has a significant influence on how shipping companies share responsibility between ship owners and company management, of course this also influences how companies operate ships. Every company must have a ship operating certificate obtained by conducting regular audits and reports to ensure the safety management system (SMS) is implemented properly.

c) *Shipload*

Cargo or ship cargo such as crude oil chemicals and other dangerous cargo must be regulated because it is very dangerous to safety and the environment. Regulations that require cargo or cargo are related to damage and losses that may be caused. The parties that regulate ship load requirements are mostly carried out by companies and Protection and Indemnity Powers that issue Carriage of Cargo By Sea regulations, one of which is the Hague Rules, Hague Visby Rules and Hamburg Rules.

d) *Crew on board*

³ The regulation governing the requirements of the crew is STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978/1995). This regulation not only regulates the minimum qualifications of the crew/crew but also regulates the institution entitled to issue training certification for the crew. Meanwhile regulations governing workers' rights and company obligations are regulated in the MLC (Maritime Labor Convention, 2006). MLC is a new regulation in the ratification process. Previously the regulation that regulated was the ILO (International Labor Organization, 1919), but for reasons that hunting on the sea (ship crew) must be distinguished from other workers, then ILO regulations were no longer applied to the crew ship crew. The MLC rules are governed by (a) Minimum age of crew/crew, (b) Health requirements, (c) Regulations on employment contracts, (d) Social security for crew/crew, (e) Minimum working hours, (f) Standards for food & crew/crew accommodation, (g) Training and facilities for crew/crew, (h) Safety procedures, work procedures, and work accident procedures, etc. Every flag state that ratifies must conduct a regular survey to ensure that the regulatory requirements are properly implemented.

e) *Environment*

Maritime transportation is the most environmentally friendly ¹ transportation mode compared to other transportation modes (Leggate et al., 2005). MARPOL (International Convention for the Prevention of Pollution from Ships, 1973/1978) is a maritime regulation that regulates requirements to prevent pollution of the environment. MARPOL only regulates the prevention of pollution from ship loads such as oil, chemicals, dangerous cargo, ship waste, garbage, atmospheric pollution and other pollution which requires tankers to have a double hull. At present the pollution originating from the ship's ballast water organisms is the focus of the regulators and becomes the forerunner to the birth of the BWM Convention (Ballast Water Management).

f) *Security*

Problems that are regulated in security are related to pirate activity and terrorism. The terrorist incident ¹³ on September 11, 2001 was the forerunner to the birth of the ISPS Code

(International Ship and Port Facility Security Code) in July 2004. The Lyold List in 2002 noted that losses resulting from piracy were more than 25 billion USD and the costs needed to increase security container load of 5-10 USD. ISPS Code regulates security requirements on board, port (Port Facility Security Assessment) and government obligations in implementing these regulations. Changes in maritime regulation can have an impact on one or more impact area, for example, the addition of safety equipment regulated in the SOLAS IIFSS Code requires the addition of a device in the form of a breathing apparatus in the ship, when viewed from the impact area, this regulation results in an impact on the Ship instrument/construction. Whereas in the changes to the regulation of MARPOL Annex II of the MEPC.118 document (52) which regulates the requirements for tank emptying and the minimum requirements for disposal of oil waste as far as 12nm from the nearest land edge, this regulation change has an impact area on the vessel instrument, and vessel operations. Whereas in the regulation of STCW Code Training for Gas Fuelled Ships, it requires the crew to conduct additional training to improve the qualifications of operating tankers using gas fuel.

7. Determinants of Risk Management Model

Risk in technical definition is the multiplication value between consequences and frequency. For example, the risk of a ship experiencing collision in a solid shipping lane can be defined as one of the possible hazards, the consequence is how much damage or loss due to the collision, while the frequency is the chance of collision in these conditions. Assessment of these consequences can be carried out quantitatively and qualitatively depending on the availability of data and other factors. Risk analysis is more difficult to measure, considering that there are several valuation parameters that do not have uniform possibilities and have an impact on the increasingly complex risks that can be caused. Some elements such as time, resources, and human errors make risk management more difficult and more complex. If divided risk analysis consists of three main components, namely: (1) risk management, (2) risk assessment and (3) ways of communicating risk. At the same time, these three components must be able to be in harmony with the three principles regarding the components of a disaster, namely: (i) opportunities to occur, (ii) consequences caused, and (iii) impacts caused.

The development of risk analysis has undergone a significant improvement process at which time risk analysis was limited to the scope of operations and evaluation of the port business. But, at this time it has shifted to long-term corporate planning. These differences in characteristics must be understood by managers and also on policy makers to form a team that will identify and assess the possibility of risk occurrence. In addition, a commitment from the port authority is needed to identify, monitor and prevent disasters that can occur in order to carry out a continuous improvement process. In the risk analysis process must pay attention to the port authority and workers at all levels. The port assessment process will involve communication from internal and external parties in order to exchange information about port clients, security costs and supply chain partners.

Risk management measures, monitors and controls important decision making processes. This goes hand in hand with the method of conducting risk assessments and how to deal with the risks themselves. In reality, there are five elements in terms of risk management which involve several adjustments in it such as: (i) risk aversion, (ii) risk mitigation, (iii) risk acceptance, (iv) risk delegation, and (v) division risk. All of which can be submitted to third parties or other organizations affiliated with the company by facilitating in terms of finance, technical, operations or other forms. The components of risk analysis can be simplified as in Figure 2.

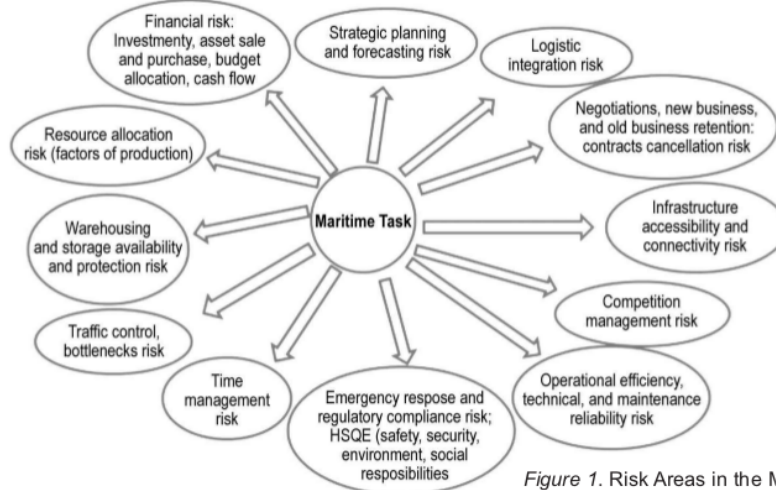


Figure 1. Risk Areas in the Maritime World
(Source: Burns, 2015)



Figure 2. Components of Risk Analysis
Source: Burns, 2015)

There are three main components that are interconnected with each other where risk assessment has a direct impact on risk management. This applies also to how to communicate the risks that will be faced to policy makers. The steps regarding risk management are as follows:

- Identification of hazards: the initial process must be done by identifying what things can cause a disaster, whether it comes from material, tools or people.
- Risk assessment and grouping: identified risks are grouped by character or other assessment parameters such as: the impact, time needed for the handling process and also how many parties need to be involved in it.
- Development of risk control: at this stage the risks that already exist and have been obtained ways to handle them are carried out in the development process in order to prevent it. This aims to ensure that in the future the existing risks can be dealt with more quickly and precisely.
- Implementation of risk control: the use of the right method after an in-depth analysis must be implemented on the method itself. This aims to determine the extent to which the method developed is able to handle the risks that exist.
- Monitoring and evaluation: at this stage supervision activities are carried out on the possibility of the emergence of risks and evaluating any changes in trends from risk.

In general the maritime industry divides the worst risks into four categories including:

- Strategic, the process of what steps will be taken in the long term.

- HSQE (health, safety, quality and environmental), focusing on health, safety and concern for the environment.
- Operational, focus on port operations efficiently, technical matters and readiness in handling risks.
- Financial, discusses investment, banking, debt, inflation, exchange rates, sale and purchase of assets, allocation, and financial arrangements and other economic aspects.

8. Maritime Industry Risk Management Model

From the reviews and various considerations of regulation and statutory and risk considerations for the shipping business, a risk management model design in the maritime industry can be arranged as an ingredient in developing risk management models in the maritime industry.

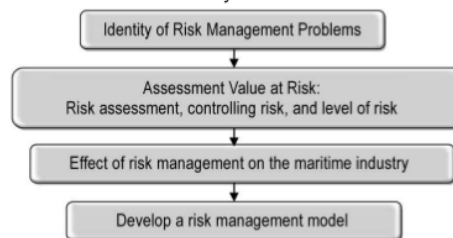


Figure 3. Design of the Maritime Industry Risk Management Model



Figure 4. Maritime Industry Risk Management Model

9. Conclusion

The maritime industry is full of regulatory changes, this is considered by decision makers to be a disruption to the continuity of the maritime industry. Changes in IMO regulation are regulatory changes that often make changes. Hence, a risk assessment is needed for changes to these regulations so that decision makers can prepare themselves to implement compliance strategies so that their business continues. The average financial impact is a consequence of changes in maritime regulations. After conducting a risk assessment of the impact of changes in regulation, it can be concluded that the investment caused due to the implementation of regulation changes per year is in the moderate category. The value of compliance costs issued by decision makers to implement these regulatory changes cannot be reduced, because the value of a tool or modification of its properties is fixed. With the impact of changes in maritime regulations that have the potential to pose a risk or financial consequence to the survival of the maritime industry, a risk management model in the maritime industry can be arranged that can be used by decision makers in determining the direction of the policy to be taken.

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