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Integrated Management Systems and Implementation in Shipyards

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Abstract

Today, organizations comply with some management standards due to developing technology and increasing competition. Although adhering to these standards are mostly voluntary, they have become a necessity to gain respect in the market and improve relationships with stakeholders.

Many businesses have been transitioning to integrated management systems in recent years. Quality, Environment and Occupational Health and Safety Management Systems form the basis of these systems. These three systems also form the basis for the study. This dissertation provides a detailed explanation for integrated management systems and examines the current status of the integrated system in Turkish shipyards. In doing so, it aims to fill the gap on shipyards in the literature. The research aim is to learn the status of integrated management systems in shipyards, determine how they will be implemented, and identify their benefits, disadvantages and challenges to the shipyards. The study has two main stages. The first stage consists of the literature review as well as all the features, benefits, difficulties and content of integrated management systems, followed by a rundown of the most important integrated management models. The second stage consists of, the survey conducted with Turkish shipyards, and its analyses, examinations as well as suggestions informed by the survey.

In conclusion, considering the survey, we can say that Turkish shipyards are eager for an integrated management system and they are trying to invest in it. However, it is obvious that a certain amount of time, effort and resources is required for these newly implemented systems.

It is thought that the study will contribute to the literature on this subject and will pave the way for possible future studies in the field.

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List of Abbreviations

AS/NZS	Australian/New Zealand Standard
AENOR	The Spanish Association for Standardization and Certification
BSI	British Institute of Standard
CSMS	Customer Satisfaction Management System
DNVGL	Det Norske Veritas Germanischer Lloyd
DS	Dansk Standard
EFQM	European Foundation for Quality Management
EMS	Environment Management System
IMO	International Maritime Organisation
IMS	Integrated Management System
ISMS	Information Security Management System
ISM	International Security Management
ISO	International Organization for Standardization
MS	Management System
MSS	Management System Standard
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health and safety
OHSA	Occupational Health and Safety Administration

OHSAS	Occupational Health and Safety Assessment Series
OHSMS	Occupational Health and Safety Management System
PAS	Publicly Available Specification
PDCA	Plan-Do-Check-Act
PEDIMS	Process Embedded Design of Integrated Management System
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
RINA	Registro Italiano Navale
SA	Social Accountability
TSE	Türk Standartları Enstitüsü
TQM	Total Quality Management
UK	United Kingdom

1. Introduction

Recently, institutions have had to comply voluntarily with some criteria to keep up with the developments in the world and to compete with international institutions. Although these practices are voluntary, they can be considered mandatory in terms of trade respectability, and they play an important role in trade relationships. Companies can demonstrate the importance they attach to their customers, business partners, and the quality of their products with an ISO 9001 certificate, their sensitivity to environmental issues with an ISO 14001 certificate, and their care towards their employees with an OHSAS 18001/ISO 45001 certificate. It has been observed that many of the benefits provided by these practices are shared or interrelated. For this reason, most organizations have started to transition to integrated management systems. The specific integrated management system that the company considers and then implements is prepared based on the needs and requirements of each institution. Integrated management systems aim to minimize the disadvantages of companies, while maximizing benefits.

The aims of this study are to recommend the Integrated Management System model in order to reduce the operational and financial burdens of the three existing systems, to examine the common points of the ways and systems to be followed in their establishment and to apply them in shipyards. Therefore, all three standards will be examined, their common points and similar aspects will be determined. In addition, the result of a survey with Turkish shipyards will be evaluated and suggestions will be included.

1.1. What Is the Integrated Management System (IMS)?

Before discussing the Integrated Management System, one needs to address the concept of integration. Integration, in its dictionary sense, is often used in the same sense as combination. However, this does not apply to management systems. Systems cannot be integrated simply by being added together. To ensure integration, certain processes need to take place (Eryaşar, 2011):

Step 1: Businesses can use different management systems at the same time. This does not mean IMS. Each system is independent.

Step 2: Comparison between systems is made to prepare for integration and similarities and differences are detected.

Step 3: Common elements remain within the organization. Different elements are examined and eliminated.

Step 4: By combining the common elements, a single system is obtained.

In the developing world, companies must ensure the safety of their production. The effectiveness of the tools and subsystems play an important role in ensuring safety and achieving success. Today, the coordinated operation of subsystems and tools is called Integrated Management Systems (IMS).

The emergence of more and more new management systems and their similarities, more so than their differences, have led businesses to integrate different management systems (Rasmussen, 2007).

Environmental, quality, and OHS management all share common elements that facilitate integration. These can be policy, internal audits, improvements, management work,

compliance and document control, and make up a large part of the systems. Thanks to these common features, the establishment of IMS provides advantages to companies in planning, implementation and compliance (Çubukçu, 2017).

Moreover, creating a shared system with IMS positively affects the company's effectiveness and continuous development (Kuru and Akin, 2012) while reducing operating and implementation costs in the systems (De Oliveira Matias and Coelho, 2002).

IMS has multiple different definitions. One definition for IMS is “the organisational structure, resources and procedures used to plan, monitor and control project quality, safety and environment” (1999 cited by Griffith, 2000, p.233). Moore defines integrated management as “the planning, monitoring and control of all aspects of a construction project that are necessary to ensure that all those involved are aware of their responsibilities and perform them safely, to the required quality and with due regard for the environment” (1999 cited by Griffith, 2000, p.234).

1.2. Result of IMS

IMS is an implementation that has been popular in recent years. Therefore, the results of IMS are just emerging. Integrated systems affect firms to a great extent. Employees, products, market position, environment, security and of course management are directly affected. The positive results from the effects of IMS are given below (Table 1).

Table 1: *The results of IMS.*

• Certification of the entire management system in one go. Thus, workload is reduced, and time is saved.
• Avoiding repetitive jobs.
• Prevention of unnecessary resource use.
• Less inspection. Thus, there is no hitch in the works.
• Awareness of employees in every respect (environment, safety and quality).
• Increased employee motivation.
• Ensuring commercial permanence and superiority.
• Increased efficiency.
• Delivery on time.
• Increased market value.
• Increase in demand.
• Increase in positive feedback and decrease in negative.
• Having a say in the international market.
• Better respond to investors' requests.
• Increased sensitivity to the environment.
• Workflows and methods are more prominent.
• Increased internal audits and more accurate.
• Protection of information and ensuring continuity.
• Strengthening the communication between departments.
• New hires are adapted to the job quickly thanks to common instructions.
• Eliminating unnecessary authority and responsibilities.
• Decrease in costs.
• According to these results, IMS is more efficient than applying other systems (environment, quality, and safety) one by one. The positive aspects of other systems are more beneficial with the integrated system.

1.3. Aims and Research Questions

Within the scope of the dissertation, the answer to the question of what should be a successful and effective IMS suitable for shipyards existing in the global competition market is answered.

Some research questions have been identified for this purpose. At the end of the thesis, it is aimed to give the answers to these questions as properly as possible.

Research questions of the dissertation are stated below:

- How to set up an IMS in shipyards?
- What are the components of IMS?
- What are the main challenges of IMS?
- What are the benefits of IMS to the Shipyards?
- What theories and models are available for IMS?
- What are the main features of IMS?

1.4. Methodology

In this thesis, the answers sought will be found by scanning the literature and surveying. With a large-scale literature review, deficiencies will be determined and detailed information about IMS will be obtained. Following examination of the many articles, a questionnaire will be sent to 47 shipyards located in Turkey and will be assessed from the answers. After the evaluation and analysis of these answers, the status of IMS will be determined in the shipyards and an implementation proposal will be submitted according to the existing situation. For the proposal, shipyards' approach to IMS, their current situation, the benefits they get from IMS, the difficulties they face, implementation models and ways and, if any, the disadvantages of IMS should be known. Every question is of great importance in the survey to be conducted. The proposal that will be presented as a result of the evaluation of the answers given will be a proposal ready to be implemented in practice.

In short, it would not be wrong to divide the methodology of this thesis into two as literature review and survey study.

Detailed information about the survey questions is given in Section 5.

1.5. Structure of the Dissertation

This dissertation consists of seven main sections. With the introduction part, the concept of integration will be given briefly about IMS and its results, the research questions and the purpose of the dissertation will be presented to the reader and the structure of the dissertation will be explained. In the literature review, previous studies will be examined and, in this context, extensive information about integrated systems will be presented. In the third chapter, the components, general features, benefits, and challenges of the IMS will be explained. IMS models will be included in Section 4. The explanation of the survey conducted with the Turkish shipyards and the examination of the survey results will be included in the fifth section. The sixth section includes the proposal for the establishment of an integrated system in a shipyard. In the last part, the results of the research and discussion will take place.

2. Literature Review

The introduction has given the definition of IMS. The literature review section will present studies related to IMS, implementation examples, and examples in the maritime sector.

There are many studies on integrated systems. It is possible to see this type of system in various areas. Automotive, marine, food, education, engineering, health, and various other fields are suitable for the use of IMS. In short, any sector with a human factor may be open to IMS implementation.

In the literature review, many approved articles, books, journals, and dissertations were examined. During this scan, both the physical and online university library collection, Google Scholar and YÖKTEZ (a common pool of MSc and PhD dissertations in Turkey) were used.

2.1. The Emergence of the Integrated Management System

Organizations use one or more management systems to ensure cohesion and management, fulfil company goals, satisfy customers, ensure environmental safety, maintain, and improve quality, and security.

Management systems became more important and systematic as stakeholders' demands increased. According to Karapetrovic (2003) and Asif, Bruijn, Fisscher et al. (2010) the wishes of stakeholders determine many things in company management. Every step taken should satisfy the stakeholders. For this purpose, companies use global management system standards such as ISO 9001, ISO14001 and OHSAS 18001 / ISO 45001 as a guide.

Rebelo, Santos and Silva (2014) stated that the certification process originated in the 1960s. This process, which started with quality, gained speed with the inclusion of environmental management systems. After the emergence of many management systems, the idea of

gathering all of them under one roof began to emerge (Bernardo, Casadesus, Karapetrovic et al, 2010).

As stated in the report submitted by the OECD (2005), it is a difficult and lengthy process to certify every management system. Therefore, it would be wiser to use a single system that will simplify things and reduce lost time. The emergence of the integrated management system starts right here.

These studies are important to understand why an IMS is needed in shipyards. The story of the emergence of the IMS in shipyards is not different from that in other sectors.

2.2. Systems Included in the Integration

The IMS is a combination of subsystems under a holistic approach (Sampaio, Saraiva and Domingues, 2012). It is also called the management system of the future (Olaru, Maier, Nicoara et al., 2014). IMS can cover many management systems, however, the important part is to decide which systems will be included in the integration (Labodová, 2004). Although the management systems have a wide sub-spectrum, the most preferred for integration are the Quality Management System (QMS), the Environmental Management System (EMS) and the Occupational Health and Safety Management System (OHSMS). Among these three, binary or triple combinations are the most preferred integrated system types (Dahlin and Isaksson, 2017). In the following sections, the contents of integrated systems in shipyards will be given. As Dahlin and Isaksson (2017) points out in their study, some shipyards integrate two management systems, while some shipyards integrate three or more management systems. This study indicates that there is no limit to the number of management systems within the integration.

QMS, EMS, and OHSMS have similar structures when analysed individually. They share many sections, goals and items in common. If we need to look in more detail, most of the common features in all three are listed below (De Oliveira Matias and Coelho, 2002) :

- Documentation
- Record
- Management policy
- Responsibility
- Application and control
- Contact
- Verification
- Audit
- Relevance
- Continuous improvement

The most important common point of the subsystems used in integration is continuous improvement (Olaru et al., 2014).

IMS started to attract a lot of attention after the release of ISO 14001, but it has gained its main popularity with the emergence of other systems such as OHSAS 18001, ISO 22000 and SA 8000 (Almeida, Domingues and Sampaio, 2014).

According to Beckmerhagen, Berg, Karapetrovic et al. (2003a), quality, environment and safety management systems are generally included in the integration. However, the real IMS should be broader and more comprehensive than these three. That is, IMS should be able to cover other additional systems that may arise in the future. Examples include social and corporate accountability, human resource management, and financial performance.

The basis of these management systems, especially QMS, EMS, and OHSMS, is the circle of Deming (PDCA cycle) (De Oliveira Matias and Coelho, 2002). The standards are structurally similar and based on the PDCA cycle. Many researchers have addressed this in their articles and researches. Bobrek and Sokovic (2006) argued that Deming's 14 points are at the core of the integration, while Jørgensen, Remmen and Mellado (2006) mentioned that the PDCA cycle must be understood to understand integration. As seen in Figure 1 below, the cycle is continuous. If we need to take a brief look at what the PDCA cycle means for IMS :

- Plan: Requirements to achieve the goal are determined. This is the turning point.
- Do: Valid and required for execution. Controls are provided and systems to be integrated are reviewed.
- Check: Returns are received, deficiencies are determined, and audits are carried out.
- Act: It is decided what to do in the future and after the control, the detected deficiencies are corrected.

Deming's circle considers the entire process from start to the end. Thus, it plays a critical role for IMS (Muzaimi, Chew and Hamid, 2017).

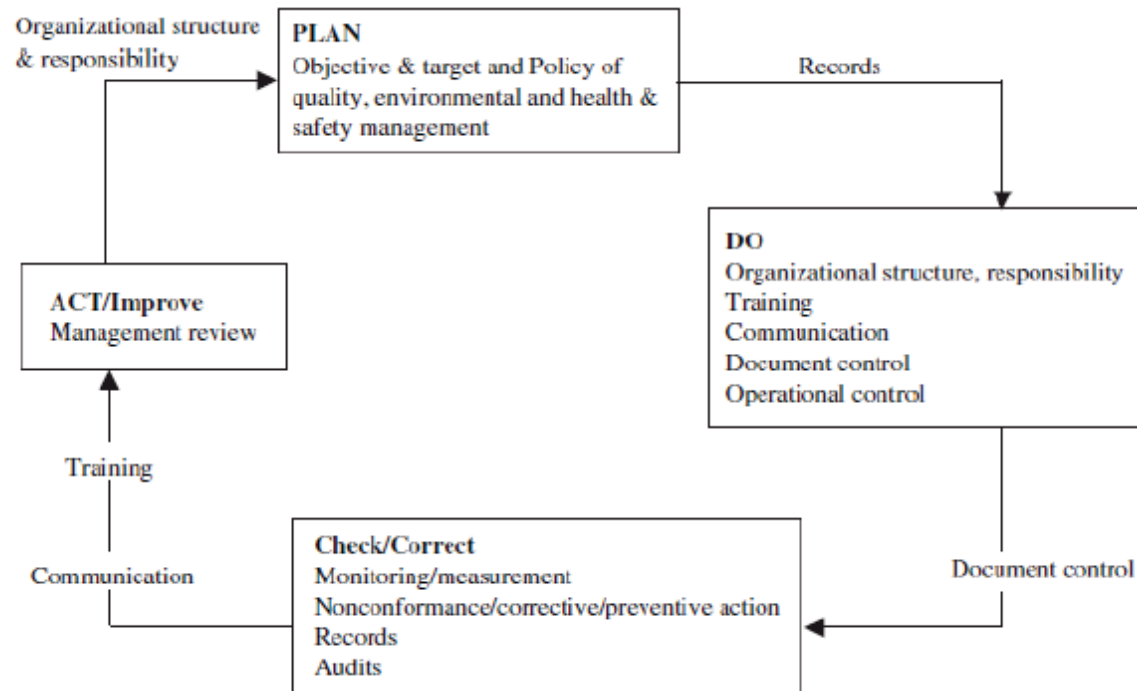


Figure 1: PDCA cycle (Source: OECD, 2005)

2.3. Integration Models and Strategies

There are many models and strategies of IMS, and many researchers have worked on this topic. In Section 5, the most important IMS models will be introduced.

Karapetrovic (2003) discussed the system approach model seen in Figure 2. Karapetrovic (2003) handled this model using the ISO 9001: 2000, ISO 14001: 1996, OHSAS 18001: 1999 and SA 8000: 2001 standards.

Von Ahsen and Funck (2001) examined three different models in detail. These are EFQM model, ISO 14001 based IMS model and ISO 9001 based IMS model. Also, Rebelo et al. (2014) conducted a research on models. According to this research, companies should choose or create an IMS model according to their goals, wishes, expectations and the status of their organization.

Especially these three studies play an important role in understanding the IMS models applied in shipyards. In addition, these studies show that there is no clear and specific model or approach for integration. Since companies have many variables, models also vary.

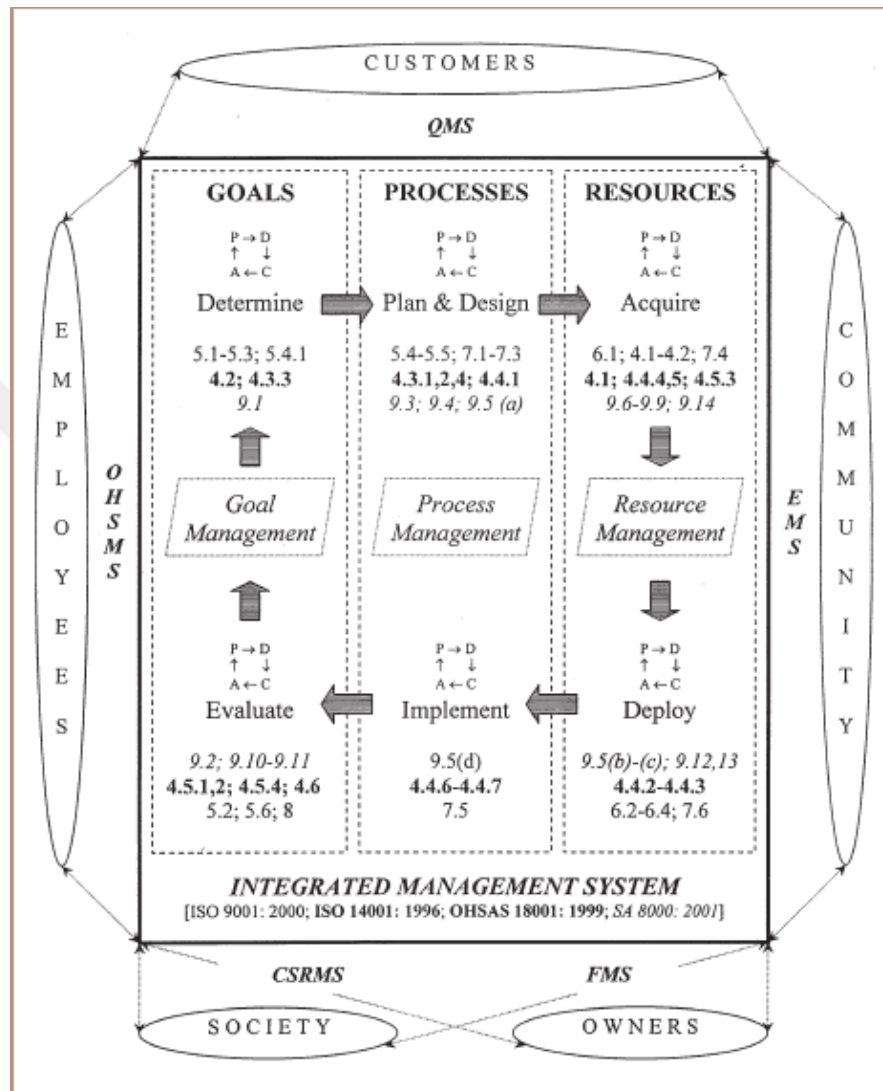


Figure 2: The system approach to IMS (Source: Karapetrovic, 2003)

Besides the models, Asif, Bruijn, Fisscher et al. (2009) examines the strategies that can be designed and implemented for integration. They came to conclusion that the three fundamental dimensions of the change Pettigrew and Whipp described in 1991 may apply to IMS.

- Content of IMS
- Context of IMS
- The process of IMS

These three dimensions must be understood to better understand the IMS and to have a successful integration process.

Furthermore, they discuss various integration strategies and researchers in their work. These strategies are briefly mentioned in Table 2 below.

Table 2: Strategies of integration

• Parallelisation of the MSS using their similarities: It only occurs using common points.
• Full integration: All relevant procedures and instructions are integrated.
• Sequence of integration of already implemented MSS: It can be in 3 ways. QMS first, then EMS; EMS first, then QMS; Both at the same time
• Sequence of integration: Success is achieved in two ways. Existing systems are integrated or started with direct integration.
• Integration through system approach: Systems are connected by losing their independence.
• Different modes of integration
• Integration requires synergy at three organisational level
• Integration through generic MSS and auditing
• Integration of all resources required to achieve an IMS: Integrating resources to satisfy stakeholders within the scope of total quality culture
• Strategies for enhancing the existing MSS

The purpose of integrating systems is not only to integrate certificates. Not all system components can be integrated during integration. As mentioned above, there are various strategies and ways to integrate. Some companies only integrate quality and environmental management, while others include OHSMS.

Also, when we examine companies, we can see differences in their integration levels. Full integration and partial integration are some examples. Some companies cannot fully

integrate. This is because they do not have sufficient resources for integration (Karapetrovic, 2003).

According to Asif, Fisscher, De Bruijn et al. (2010), different lines of business approach integration differently. Some firms have addressed integration with stakeholders, communication with stakeholders, stakeholders' needs, merging tactical and operational activities, and future needs. Some companies have approached integration by taking the common point of the systems, reactively against external pressures and by developing teams at the tactical level.

Many features and requirements can be integrated and shared, but one should not forget: not everything can be integrated. Therefore, the integrated system has its own unique requirements (Almeida et al., 2014). Otherwise, there may be a risk of underestimating one or more of the systems (Jørgensen et al., 2006). The integration process should consider company policy, management style, subsystems, company image, market position and resources (Sampaio et al., 2012). Like any system, IMS should be developed as a tool to support the development of businesses (Griffith, 2000).

Labodová (2004) also conducted a study on strategies. Labodová (2004) states that, in its simplest form, organizations can implement integration in two ways. The systems should either be implemented step-by-step or the integration should be implemented directly at the beginning.

However, institutions that start directly with IMS are rare. Organizations generally adopt IMS later. In this case, if the establishment is small, there will be no problems, but in developed or developing institutions, the transition will be painful. For a smooth transition, human,

government support, and information resources should be sufficient. Furthermore, the excessive bureaucratic systems in these transitions will damage IMS (OECD, 2005).

All these studies on models and strategies serve as a guide for us to understand and classify IMS used in shipyards.

2.4. Features, Benefits, Challenges, and Disadvantages of IMS

A lot of research has been put forward on the features, benefits, challenges, advantages, and disadvantages of IMS. De Oliveira Matias and Coelho (2002), Zutshi and Sohal (2005), Zeng, Xie, Tam et al. (2011), Bernardo *et al.* (2012), Domingues, Sampaio and Arezes (2015), Dahlin and Isaksson (2017) have demonstrated the benefits, advantages and disadvantages, and challenges/difficulties of integrated systems in different ways and in different regions.

It is noteworthy that there are almost no studies on features, benefits, disadvantages and difficulties on behalf of shipyards in the literature. Although these studies in the literature are prepared for many different sectors, a study for shipyards will be given in the continuation of the dissertation by using this information.

The advantages, results and difficulties of integration may differ due to the lack of a standard of integration and the type and level of integration of organizations vary. Bernardo *et al.* (2012) divide the difficulties into internal and external difficulties. In their survey with 176 participants, they observed that the most important difficulty was a "lack of human resources". Domingues *et al.* (2015)'s work also supports this view. These difficulties should be considered when integrating the systems. If these difficulties are not addressed in the early stages of integration or before integration starts, it can grow and negatively affect the success of integration or delay the completion of integration (Zutshi and Sohal, 2005). However, it

should not be forgotten that the main challenge is to transform the goals and policies set for quality, environment, and safety into a single management plan (Griffith, 2000).

Integrated systems have many benefits. However, it should be noted that IMS should cover the entire product chain and stakeholders to achieve significant benefits (Jørgensen et al., 2006). Due to differences in management systems, the benefiting segments may also be different (OECD, 2005).

- OHSMS -> Employee
- EMS -> Non-human
- QMS -> Client

On the other hand, organizations that do not have an IMS have some disadvantages. Different backgrounds and expectations of managers in management systems (MS), departmentalization, repetition of efforts and increase in bureaucracy are some of them (Domingues et al., 2015).

We can also divide the benefits in two, internally and externally. Reductions in bureaucracy, decrease in costs, unification of targets, decrease in productive processes, increase in synergy between management systems, increase in efficiency, optimization of resources are some of the internal benefits. As external benefits, we can say that competitive advantage, improvement of promotional features, meeting legal requirements, market advantage, integration of external audits, increased corporate responsibility and increased sustainability (Zeng et al., 2011; Olaru et al., 2014; Rebelo et al., 2014; Domingues et al., 2015; Muzaimi et al, 2017).

Apart from all the opportunities IMS provides, integration is not easy to start, maintain and improve (Zeng et al., 2011). IMS may face some risks while overcoming all these processes. These risks should be identified, and precautions should be taken (Stefanovic and Jevtic, 2013) and risks should never be taken lightly. Planned action is critical for IMS. Situations before and after integration should be considered and analysed (Sampaio et al., 2012). Companies should take some precautions before integrating the systems considering these risks. Although the systems share some commonalities, their differences should also be taken into account. Karapetrovic and Willborn (1998) stated that examining and analysing the differences between systems is necessary for integration. These differences can cause difficulties in establishing the integration. Also, if these are not considered when implementing the integration, the integration will fail or not be efficient enough.

2.5. Critical Factors Required for IMS to Achieve its Goal

Karapetrovic (2003) evaluates integration goals and argues that an IMS that includes quality, environment and OHS will target business excellence as a first step. IMS is expected to succeed with the business excellence created. Integration is not easy to achieve. There are some critical points for IMS to succeed. Top management commitment, appropriate resources, internal communication, training, continuous development, support of customer employees and certification organizations are just some of the requirements (Domingues et al., 2015). Almeida et al. (2014) add experience and motivation to these critical factors. An integration that has been successfully implemented and has successfully reached its goals enables companies to be more dynamic, more compatible, and more competitive in the long term (López-Fresno, 2010).

Another important point after all the processes are created is audit. For the first time in 2002, an audit guide was issued for a system integrated by ISO in the form of environment and quality (ISO 19011). According to Beckmerhagen et al., (2003b), audits should be specific to integrated systems. It is an erroneous approach to implement audits created for individual systems in a directly integrated system. IMS is a system in of itself. New knowledge and expertise are needed when an IMS is audited. An IMS becomes feasible after a successful audit.

2.6. Surveys and Interviews on IMS

Since the main element of the dissertation methodology is the survey study, the survey studies in the literature and their results are mentioned briefly. These studies will be a good benchmark tool for the evaluation of the questionnaire in Section 5.

Many surveys and interviews were conducted with various companies in various countries, and the results were analysed and interpreted.

According to research conducted by Sampaio et al. (2012) in Portugal, approximately 60% of the companies surveyed integrated quality and environmental management, while 10 percent included OHSMS. 15% remained outside of IMS. Investigating the impact of IMS on the construction industry, Griffith (2000) conducted a 25-question survey with 12 companies. The results were supportive of the IMS definition and purpose. According to the study, although the companies were at the beginning of the road, their preference for IMS was a promising move for the future.

Jørgensen et al. (2006) compared integrated systems in Denmark and Spain. In Denmark, the majority preferred the quality-environment integration. The situation was similar in Spain. While a 55% integrated QMS and EMS, a 30% added OHSMS to it.

Douglas and Glen (2000 cited by Eryaşar, 2011) investigated a research that it was did in 1997, in UK. This study was conducted among 17 companies. About 60% of the companies participating in the study wanted to integrate their environmental management systems with quality and/or OHS. Although none of the participating companies had implemented an integrated system at the time, they showed intention to do so.

2.7. IMS in the Maritime Industry

The maritime industry is not much different from other business areas. Shipyards, ports, marinas produce specific products and services. Customer satisfaction, environmental sensitivity and OHS are important in these companies, just like other businesses.

Over the years, many shipping companies have used various management systems in both land organizations and ships at sea. These systems were used separately for a long time. Then, the rising trend of the last 20 years, IMS, started to be used in these businesses. However, despite the experience obtained, the processes and instructions in management systems in the maritime sector have not been fully integrated, especially in recent years.

Although there is not a lot of research under the field of "integrated managements in maritime companies" in the previous literature, a few studies have been compiled and analysed.

Popovic and Orlandic (2017) touched on integrated management systems at ports and explained why IMS is required at ports. Generally, quality, environment and OHS are integrated. The results, benefits, and barriers are similar to those of other industries. They stated that port service users, internal requirements and International Security Management (ISM) regulations should be taken into account when determining the concept of integration. While examining these requirements, they also compared the ports of Montenegro and other Mediterranean countries in terms of integration use. This result shows that maritime

companies in Montenegro have generally implemented integration based on ISO 9001. However, it was observed that countries on the Mediterranean behave differently. In other Mediterranean countries, EFQM model was generally preferred.

IMS provides an explanation for modern procedures at port applications. Moreover, the port authorities (managers and port security) obtain the correct information required for decision making and operational activities in a timely and complete manner with the integrated system (Popovic and Orlandic, 2017).

The interdependence of environmental management and port management is undeniably important. García-Onetti, Scherer and Barragán (2018) proposed an approach to fill the gap between environmental management and port management, arguing that the continuous growth and development of maritime businesses endanger the coasts and the ecosystem. Therefore, they stress the need for an integration with ecosystem-based EMS, QMS and OHSMS that could be implemented in ports.

Finally, Inalman (2006) explains how to apply IMS to shipbuilding companies by examining the models of IMS. In the maritime sector, it is of special importance to protect the environment, to prioritize quality, and to gain a sense of responsibility towards human health and third parties. With the International Maritime Organization (IMO) and the rules and conditions imposed by the seashore, relatively quality and safe operations at sea are provided. In addition to the rules, with the changing requirements of the market, ship operator companies are looking for new ways to increase their competitiveness, to ensure smooth ship operation and to decrease operating costs. IMS offers all companies a way out. However, unlike all other sectors, IMO has also incorporated ISM rules for such companies into an integrated system. Inalman (2006) explains the subsystems of IMS, and ISM and presents the model required for

their integration. Furthermore, according to İnalman (2006), if the integrated management system operates in full and in accordance with its purpose, the losses to third parties are minimized and the events that will bring serious financial liabilities to the shipowners are prevented.

A great amount of work has been done on IMS. Articles have been written, research and surveys have been conducted. Although IMS has certain features, advantages, benefits, and challenges in the overall picture, they may undergo minor changes on the organizational level. In this literature review, the studies related to IMS were introduced. However, thanks to this review, we saw that the work on integrated management systems in shipyards was either not done or very inadequate. In this context, together with the studies mentioned above, how to integrate in shipyards, its benefits, deficiencies, disadvantages and difficulties of IMS will be explained. Thus, the striking gaps in the literature review will be filled.

In the next step, all the details of QMS, EMS, and OHSMS, which are used most in integrated systems, as well as IMS, will be explained in detail.

3. Concept Framework of IMS

In this section, the three most preferred systems in integrated management systems are examined, similar and different points of these systems are discussed, the properties, benefits, advantages and challenges of IMS are examined in detail . Quality, environmental and the OHSMS were examined, respectively.

3.1. Basic Elements of IMS

The information obtained from the literature review is very valuable. The benefits, general features, requirements of IMS, and even all challenges encountered during implementation are clearly demonstrated by research (Rebelo et al., 2014). However, a single and accurate judgment on how to integrate systems has not been made. Many researchers have presented different models and proposed different forms of implementation. As mentioned earlier, not all integrated systems are alike, and they may have different goals and different requirements to be met. As an example, Rasmussen (2007) said that there will always be different models for integrated systems.

According to López-Fresno (2010) and other researchers like, Von Ahsen and Funck (2001) and Beckmerhagen et al. (2003b), various countries such as Australia, England, Denmark and Spain (AS/NZS 4581:1999, PAS 99:2012, DS 8001:2005 and UNE 66177:2005) take steps to develop their own international IMS standards in line with stakeholders' wishes and company interests and with the help of various references. Many more countries are trying to take this step and their number will increase in the future.

It is known that quality, environmental and OHSMS are used mostly within the scope of IMS. In this case, first, it is necessary to research and analysed these systems in detail. As a result, following "from the general to the specific" path helps us understand what is desired.

3.1.1. Quality Management System

Quality comes from the word "qualis", which means "how it was formed" in Latin. Quality is a subjective concept. The quality of the product that can be measured, determined, and often determined by quality standards or regulations is objective quality. The purpose of quality is to show what the product and service really are.

There is no standard for the definition of quality because of its direct relevance to the user's expectations and needs and their variability (Minas, 2006). Quality has been described as "the single most important force leading to the economic growth of companies in international markets" by Feigenbaum. According to Deming, reliability and invariance can be estimated to meet the needs of the market at a low cost. According to Juran, quality is fitness for use. Crosby defines quality as conformance for requirements (Reeves and Bednar, 1994, p.419). Quality is the sum of features that are based on the ability of a product or service to meet specified or potential needs (ISO 9000:2015). All these definitions have one thing in common: satisfaction of customer needs and expectations.

For the quality to be applied properly, it needs a management system. The quality management system (QMS) consists of activities in which organizations determine the resources and processes required to achieve the desired results for their purposes (Çubukçu, 2017). QMS conducts processes and resources in the most effective way. In this way, the producers and consumers do not lose, on the contrary, they gain value. QMS is controlled by top management and optimizes resource utilization in line with the decisions of top management.

The QMS ensures that the organization is better managed and that employees are partners in quality. In addition, the QMS provides infrastructure for continuous improvement while

ensuring better customer expectations. QMS is an important step for institutionalization and strengthens internal communication.

Moreover, quality control and quality assurance concepts are included in the quality management system (Ayhan, 1997, p.31-33). Also, Dale et al. (2007 cited by Zhou, 2011) supports this explanation. In addition to this explanation, they added inspection and gathered them all under total quality management. According to them, quality management is divided into four stages:

1. **Quality Inspection:** The part where the measurements and tests are made, and the conformity assessment is made
2. **Quality control:** The part of the measurement that is focused on meeting the needs of quality
3. **Quality Assurance:** It is the whole process that focuses on whether the quality meets the required requirements.
4. **Total Quality Management (TQM):** It includes the application of quality management principles to the entire organization.

Figure 3 shows the quality management system and its components:

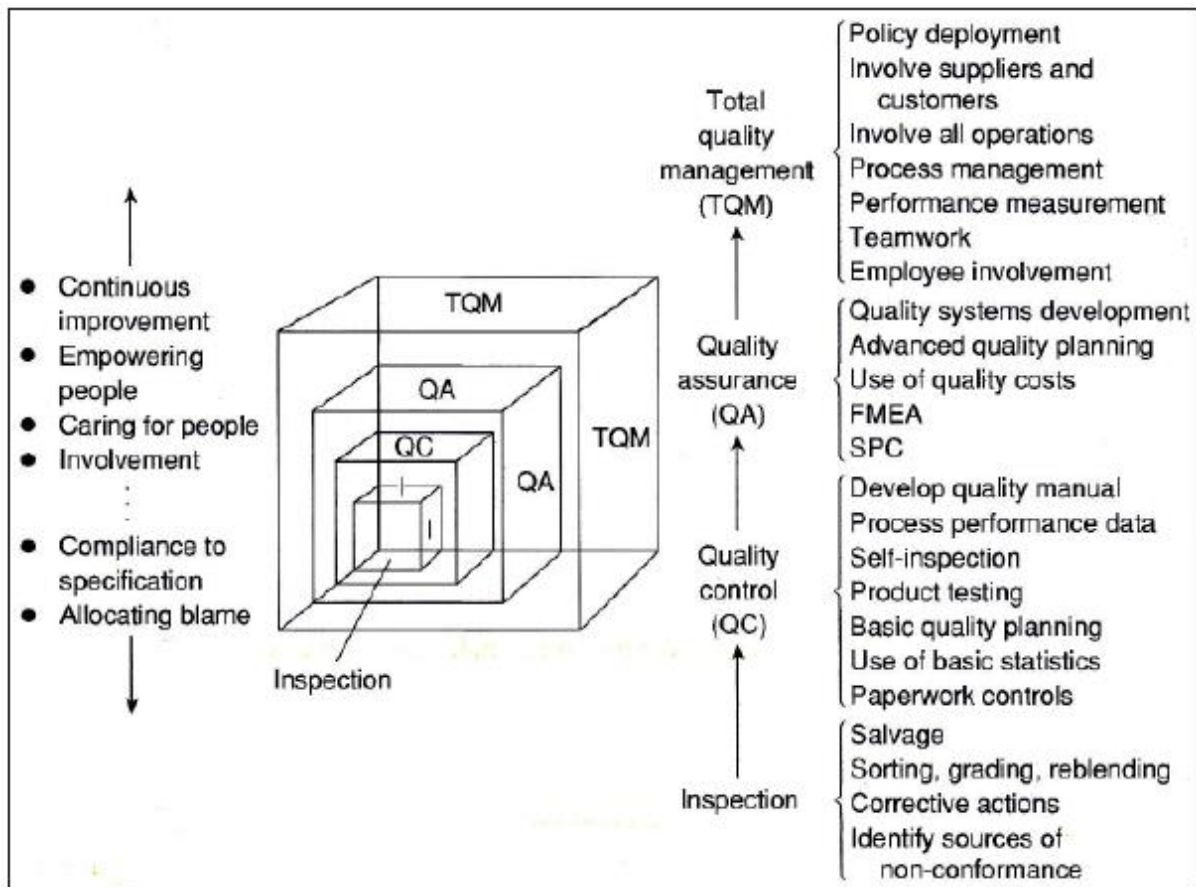


Figure 3: Four Levels in the evolution of TQM (Source: Zhou, 2011)

It is also possible to see the distinction in Figure 3 in the ISO 9000 series.

The most known and most used quality management system is ISO 9000 QMS standards series. The ISO 9000 Standards series, which guides the questions on how to create quality in businesses, how to provide quality products or services, was first published by the International Organization for Standardization (ISO) in 1987. These standards are documents designed to meet the minimum quality requirements of the organization in each industry.

It has been emphasized by various researchers that quality is not only about the products and services of the company, but that quality assurance systems that meet ISO 9000 standards are only an important first step towards perfection (Gotzamani and Tsiotras, 2001).

Organizations must establish a Quality Management System (QMS) by sticking to the standards. It should identify the processes needed for the quality management system and ensure that they exist in harmony with each other. The resources required for these processes should be identified and provided (Başaran, 2016). Within the framework of continuous development, training should not be interrupted, observations and tests should be carried out and measurement should be continued. Products and services provided by suppliers should be constantly checked and included in the QMS (İnalman, 2006) .

ISO 9001: 2015 comes into play here. This minimizes companies' implementation problems, as it is a completely customer-oriented management system. Each organization can apply the standard by describing its processes under this management system.

3.1.1.1.ISO 9001:2015 Quality Management System and Principles

ISO 9001 is a dynamic standard. It has been constantly evolving and changing since its first appearance. With the changing demands of organizations and stakeholders and the changing age, the content of the standard has also changed. In this context, a review is carried out every 5 years to check the market conditions. ISO 9001: 2008 version was valid until September 2018. The PDCA cycle is always at the core of this standard and change. ISO 9001: 2015 has become the industry leading standard in recent years. With this management system, less waste generation, increased productivity and efficiency, increased customer satisfaction and regulation of daily routines are aimed (Almeida, Pradhan and Muniz, 2018). However, unlike

other versions, the 2015 version focused on integration in more detail (ISO, 2015). Figure 4 shows the annual historical and regional trends in ISO 9001 certification.

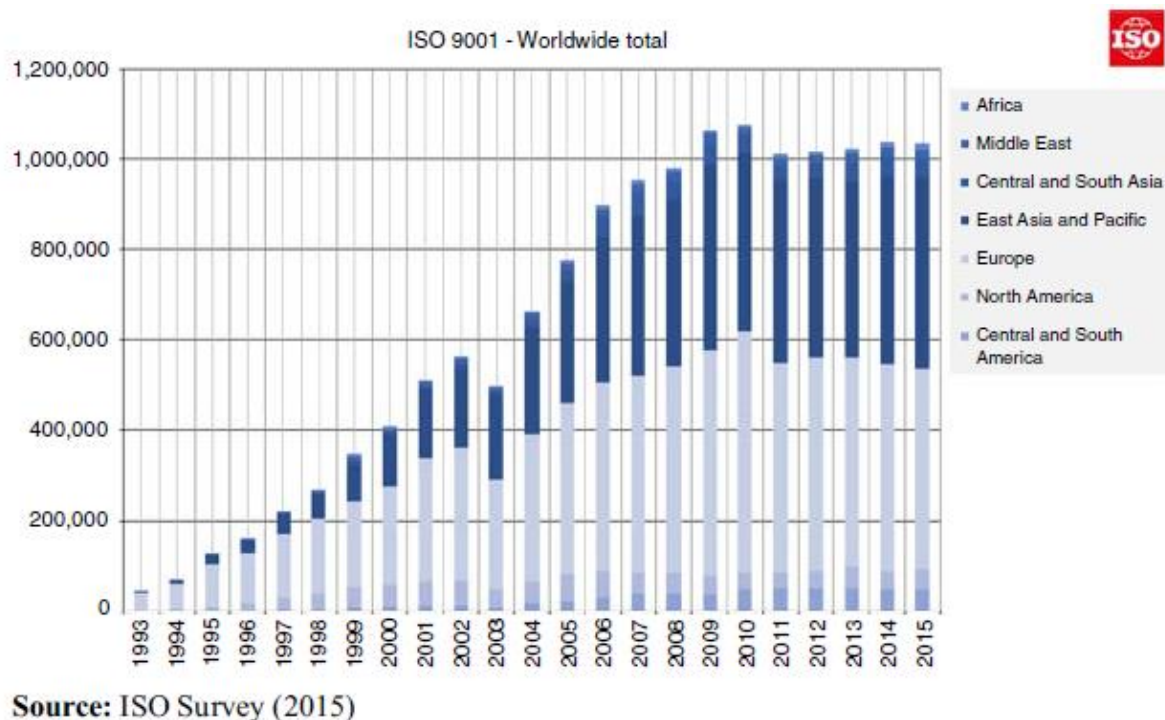


Figure 4: Annual historical and regional trends in ISO 9001 (Source: ISO, 2015)

The 2015 version includes the following topics.

- Leadership
- Objectives, control and evaluation of objectives
- Inter-party information exchange and awareness
- Risk management focused perspective
- Less rules

With ISO 9000: 2015 version, it focuses on seven basic management principles:

1. Customer focus
2. Leadership
3. Engagement of people
4. Process approach
5. Improvement
6. Evidence-based decision making
7. Relationship management

If ISO 9001 is implemented effectively, it can provide organizations with internal and external benefits (Table 3) (Başaran, 2016; Almeida et al., 2018; Ahmudi, Purwanggono and Utami Handayani, 2018; Kachapilly Joseph, 2011; Susnienė and Sargūnas, 2018).

Table 3: Benefits of ISO 9001

<u>Internal benefits:</u>	<u>External benefits:</u>
• Cultural change in staff	• Increased customer satisfaction
• Organized behaviour	• Increase in customer loyalty
• Quality awareness in the establishment	• Increase in market share
• Management effectiveness	• Being ready for official inspections
• Planning	• Increase in corporate image
• Better documentation	• Increased competitiveness
• Productivity increase	• Creating new markets
• Cost reduction	• Decrease in customer complaints
• Being open to continuous improvement and development	• Operational costs reduction
• Increase in employee motivation	
• Development of not only the process but also the employees	

ISO 9001: 2015 consists of ten sections. These sections are divided into sub-sections and detailed (Ahmudi et al., 2018). It is possible for the organization to comply with ISO 9001: 2015 Quality Management System by applying all the sections.

The quality management system does not have to be applied to all processes of the organization. If desired, selected areas and processes can only be evaluated within this scope. In cases where ISO 9001 is partially applied, this exclusion requirement is clearly stated both in the internal quality manual and in the documents available to all stakeholders. It is possible to see the PDCA cycle, which is a continuous improvement model, in these ten sections. Table 4 shows both these ten sections and where the PDCA cycle is involved.

Table 4: Sections of ISO 9001

PDCA	NUMBER OF TITLE	SECTION	CONTENT OF THE SECTION
-	1	Scope	What/why/In which activities should the organization adopt this standard?
-	2	Cited Standards	Compliance with other management system standards
-	3	Terms and Descriptions	Common terms in other systems and definitions of other terms mentioned in this standard
Plan	4	Organisation and Content	The purpose and strategic direction of the organization
-	5	Leadership	Management's commitment, quality policy, responsibility, and duties
-	6	Planning	Planning to achieve quality goals and point out risks and opportunities
-	7	Support	Employees, infrastructure, information, communication, documented information
Do	8	Operation	Identifying customer needs, design, sales, after-sales support
Check	9	Performance Evaluation	Customer satisfaction, analysis, internal audits and management review
Act	10	Improvement	Non-compliance, corrective action and continuous improvement

3.1.1.2. Quality Management System in Shipyards

In order for the shipyard to be managed with a quality management system, the top management must have fully believed in the need and benefit of such a system and must have been fully informed about the subject (Güçer, 1998).

Generally, we can see the TQM within the management system. Quality is a necessary factor not only in production but also in all areas of the shipyards. Quality should be considered in design as the first and most important step. Quality planned design reduces the number of workers, job completion time and cost. From another point of view, the quality logic that should be in every field supports total quality management (Lyu and Gunasekaran, 1993).

We can talk about the five components of TQM in shipyards (Dwivedi and Maffioli, 2003):

- 1. Construction Accuracy**

This component is concerned with the application of the principle of zero defect in shipbuilding.

- 2. Concurrent Engineering**

Concurrent engineering methods are used to reduce the time it takes to develop the approach in production, reduce engineering work, reduce costs and bring to market.

- 3. Quality Standard**

It includes a description of the methods used in the shipyard, which increases productivity and benefits stakeholders.

- 4. Quality Assurance**

It includes how to meet the quality requirements and all the necessary systematic activities in the shipyard.

5. Quality Control

It includes how the existing plan should be protected while processes are taking place and the monitoring of processes.

The implementation of ISO 9001 in shipyards is not much different from other businesses.

However, more attention should be paid as shipyards have a dynamic structure and are considered heavy industry.

Güçer (1998) explained step by step how ISO 9001 standards can be applied to shipyards.

Güçer shared the details and implementation of the sections included in the revision at that time. In a newly built shipyard, all processes and inter-process relationships should be within the scope of quality. If shipyards see the quality system as a purely documentation system, it will be very difficult for them to achieve success (Güçer, 1998).

The establishment of the quality system on the shipyard processes in a profession where products, semi-finished products and raw materials are used, such as new ship construction, makes the system understandable (Güçer, 1998).

Classification society and a conformity assessment organisation can provide the necessary certifications for shipyards such as ISO 9001. These are the organizations that have the certification authority and offer recommendations to the design of the ship by arranging the inspections during and after the new construction of the ships and in the operation of the shipyards.

Almost many countries have these organizations and these organizations are in constant communication. These organizations that know each other also know each other's certifications. RINA, DNV GL, Lloyd GL, Bureau Veritas and Turkish Lloyd are some of them.

3.1.2. Environment Management System

The purpose of this standard is to provide organizations with a framework to protect the environment and to respond to changing environmental conditions in balance with socioeconomic needs. This standard sets requirements for organizations to achieve their intended output for the organization's own management system (TSE, 2015). Also, EMS is a problem identification and solving tool. Firms must thoroughly decide why it is necessary and accept responsibilities before implementing it (Jaju and Mohanty, 2008).

Environmental issues are based on dates that cannot be said to be too old for companies. The 1972 Stockholm Conference is the first place to address environmental issues at the international level. The first concrete steps regarding the environment were taken in 1987 by the United Nations. In 1992, England performed its first standard study on environment with BS 7750 standard. This study also formed the basis of the (1996) ISO 14000 environmental management system standards series (Çubukçu, 2017). Figure 5 shows the annual historical trends in ISO 14001 certification (Heras-Saizarbitoria and Boiral, 2013).

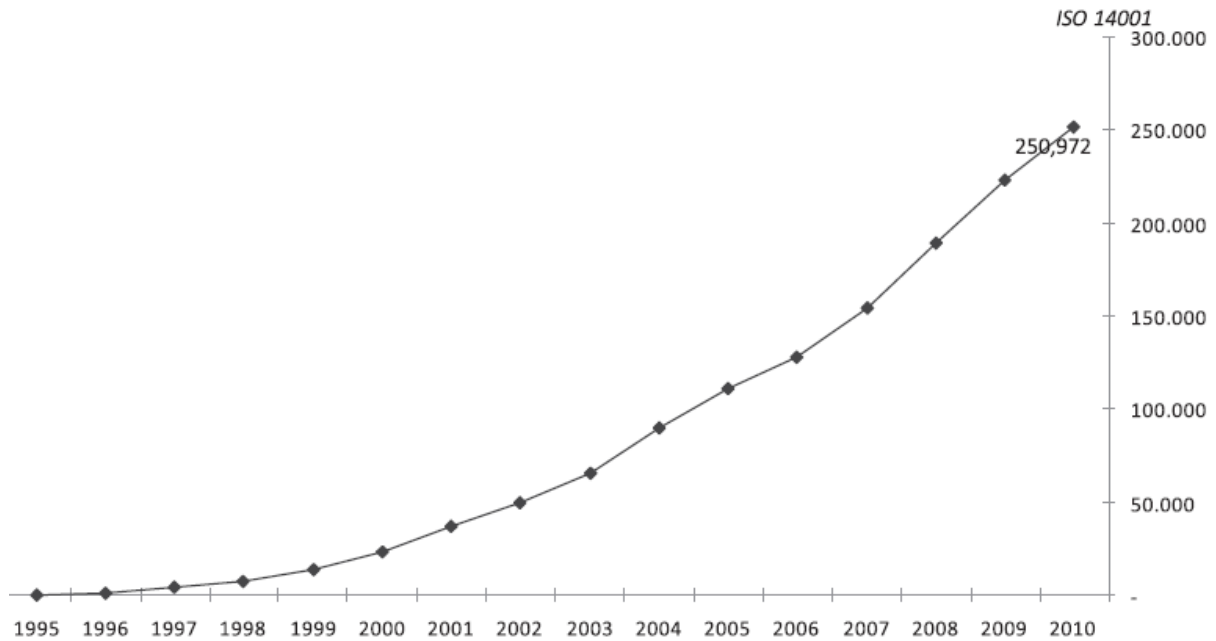


Figure 5: Annual historical trends in ISO 14001 (Source: Heras-Saizarbitoria and Boiral, 2013)

Thanks to certified EMSs, companies focused on cleaner production, eco-efficiency, and assessment of the life cycle of products (Campos, Heizen, Verdinelli et al., 2015). Although there are common points of focus, organizations can implement EMS differently because they are under different environmental conditions. This flexibility of EMS makes it easy to apply. In addition, organizations pay attention to two things when implementing an EMS: compliance and minimization of waste (Bores, 2011).

The most known and most used environmental management system is ISO 14001 (Qi, Zeng, Tam et al., 2011; McGuire, 2014; Compas et al., 2015). ISO 14001 covers air, water, soil, natural resources, vegetation, human and their relationship with each other. ISO 14001 is a standard that guides the determination of environmental factors in the process from the raw material

to the customer and to minimize the environmental damage by controlling these factors with the necessary precautions.

There are many reasons for the implementation of this voluntary standard, unlike ISO 9001 (McGuire, 2014). These reasons can be divided into two as internal and external factors (Table 5) (Compas et al., 2015; Joseph, Nichol and Jonathan, 2019):

Table 5: *Internal and External factors*

Internal Factors	External Factors
The emergence of the intervention	The image of the organisation
Improved flows of information	Market advantage
Employee motivation	Customer demand
Waste reduction	Good communication with stakeholders
Increased operational efficiency	Increase compliance with international legislation
Financial and organizational benefits	Be prepared for emergencies
Efficient use of resources	
Saving energy	

Some obstacles may be encountered in an EMS installation. The biggest obstacles are documentation and training of employees. Other obstacles can be listed as follows (Madi, Joseph and Rahmat, 2017):

- Lack of support and resources
- Unclear instructions
- Lack of guidelines for setting goals
- Not knowing how to make continuous improvement
- Financial liabilities

3.1.2.1. ISO 14001:2015 Revision

ISO 14001 must adapt to changing conditions. For this reason, it has three different revisions.

The 2015 revision is the latest revised and active version. Structural changes occurred with the 2015 revision. According to the latest revision, companies should have a structure called high level structure. Its high-level structure should include the following points:

- Identical structure for all management systems
- Core texts and definitions are used in the same way in all standards
- Easier understanding of norms
- More effective implementation of integrated management systems

This structure has opened the door to more effective implementation of integrated management systems. This method focuses on the harmonious operation of different management system standards while aiming for consistency. In addition, this revision places more emphasis on environmental aspects in the supply chain than others:

- Environmental impact assessment and evaluation of the effects of the rings before and after in the supply chain as well as the activities in the organization
- Assessment of environmental impacts throughout the life cycle of products and services
- Evaluation and control of threats and opportunities associated with environmental impacts

The 10 sections of ISO 14001:2015 are shown in Table 6:

Table 6: *Sections of ISO 14001:2015*

NUMBER OF TITLE	SECTION
1	Scope
2	Cited Standards
3	Terms and Descriptions
4	Organisation and Content
5	Leadership
6	Planning
7	Support
8	Operation
9	Performance Evaluation
10	Improvement

This management system was established based on the PDCA cycle, just like the quality management system. With an EMS with PDCA-based ISO 14001, companies should:

- Identify and control environmental impacts
- Continually improve environmental performance and
- Apply a systematic approach to achieving environmental goals (McGuire, 2014).

There are some basic changes that are intended with the 2015 revision. With these changes, firms made it easier for the quality management systems to cover the basic processes of the business and they benefited greatly from it. Basically, we can talk about five changes:

- Leadership emphasis
- Focus on risk management
- Goals, measurement, and importance to change
- Communication and awareness
- Requirements that require less rules

3.1.2.2.EMS in Shipyards

One of the most important systems of the shipbuilding industry is the EMS (Fet, 1998). There are many elements that can pollute the environment in the shipyards. Therefore, shipyards must establish and publish a policy within the scope of environmental standards requirements.

Shipyards prioritize protecting the environment, reducing waste, using appropriate technology for recyclable waste, and reducing natural resources and energy consumption by keeping all environmental effects to a minimum with a suitable EMS . For the continuity of the system, the entire system should be constantly reviewed by top management. In addition, top management is responsible for the "Environmental Aspects Examination Procedure", which was created to determine the environmental dimensions of all activities and to take measures (İşlek, 2010).

While ISO 14001 provides the basis for more efficient management of environmental dimensions and opportunities, it aims to minimize the environmental damage caused by the activities of the shipyards and reduce the consumption of energy and raw materials (İşlek, 2010).

Shipyards start with three steps within the scope of ISO 14001 (Fet, 1998):

1. Define environmental policies
2. Identify environmental issues and impacts
3. Objectives and targets established

İşlek (2010) also examined many environmental risks existing in shipyards and explained the precautions to be taken against them based on ISO 14001. To take a look at some of the risks, they are as follows:

- Blasting and painting activity risks
- Pressure washing activity risks
- Cutting and welding activity risks
- Fire and electrical risks
- Hazardous waste area risks
- Bilge and ballast water risks
- Launch activity risks

Moreover, the environment management system is very suitable for integration. Especially the regulations of occupational health and safety management systems (OHSMS) and EMS are very similar. Therefore, many shipyards can use these two systems in integration instead of dealing with them one by one.

In summary, shipyards using appropriate EMS such as ISO 14001 create an environmentally friendly and reliable company image.

3.1.3. Occupational Health and Safety Management System (OHSMS)

OHS refer to the corrective and preventive measures taken regarding the health and safety of all factors in the job description.

OHSMS, by the definition of Çetinkaya (1989 cited by İşlek, 2010), refers to the systems in which the measures taken regarding work safety are made within a systematic.

Many organizations in many countries are making serious efforts to prevent health and safety problems. In addition to giving importance to education and control, these countries are concentrating their workplaces under intense control (İşlek, 2010). In response to the demands of companies, many national and international organizations have developed various OHS models or guides (Mohammadfam, Kamalinia, Momeni et al., 2016). Occupational Health and Safety Administration (OHSA) was established in 1970. By 1996, the BS 8800 standard, in which OHS studies were standardized, was published by the British Institute of Standards (BSI). Since this standard cannot serve its purpose, OHSAS 18001 was published in 1999. Like other management systems, the PDCA cycle forms its basis. Also, BS 8800 played an important role in its emergence. However, unlike BS 8800, it identifies critical management elements that must be present in the system (Serin and Çuhadar, 2015).

OHSAS 18001 was created with the same methods to comply with ISO 14001. OHSAS 18001, one of the most known OHS management systems, has been replaced by ISO 45001 in recent years (Toy, 2015). Firms with OHSAS 18001 should transition to ISO 45001 within 3 years of March 2018. The purpose of these two systems is the same. However, there are similar points as well as differences:

- ISO 45001 is process-based, and OHSAS 18001 is procedure-based.
- All articles of ISO 45001 are dynamic, not all OHSAS 18001 are dynamic.
- ISO 45001 considers both risks and opportunities, OHSAS 18001 only evaluates risks
- ISO 45001 includes opinions of interested parties, OHSAS 18001 does not
- ISO 45001 supports full integration more than OHSAS 18001

The sections of OHSAS 18001 are as shown in Table 7.

Table 7: Sections of OHSAS 18001

NUMBER OF TITLE	SECTION
1	Scope
2	Cited Standards
3	Terms and Descriptions
4	OH&S Management System
4.1	General Requirements
4.2	OH&S Policy
4.3	Planning
4.4	Implementation and Operation
4.5	Checking
4.6	Management Review

Sections of ISO 45001 are as shown in Table 8:

Table 8: Sections of ISO 45001

NUMBER OF TITLE	SECTION
1	Scope
2	Cited Standards
3	Terms and Descriptions
4	Organisation and Content
5	Leadership
6	Planning
7	Support
8	Operation
9	Performance Evaluation
10	Improvement

OHSMS consists of five stages that define each other with an acceptable and feasible policy and develop with continuous improvement :

1. Determining the strategy and goals
2. Creation of OHS organization
3. Implementation of plans and strategies
4. Evaluation
5. Taking measures according to the results

As can be seen, these stages coincide with ISO 45001 headings.

OHSMS has many advantages. Altınok (2001 cited by İşlek, 2010) listed its advantages as follows:

- Disease and disability are reduced
- Staff motivation increases
- Efficient use of resources increases
- Compliance with the law
- Firm image improves and competitive advantage increases
- Scientific deck card
- Effective strategic planning is done
- Audit process improves

3.1.3.1.OHSMS in Shipyards

OHSMS plays a major role in the development of the heavy industry shipbuilding industry.

Considering the risk groups, the shipyards are in the high-risk group in terms of OHS. As with

companies in every risk group, the most important point in OHS studies is to try to prevent risks before they arise (Menteş, İnce and Özcan, 2017).

If the accident statistics in the shipbuilding sector are analysed, it is understood how important OHSMS is. Properly implemented OHSMS will reduce these rates. Table 9 shows the results of the work done by Tezdoğan (2009 cited by İşlek, 2010) between 2000-2008, in Turkey. These statistics reveal a serious lack of system.

Table 9: Accident statistics in the shipbuilding industry (Source: İşlek, 2010)

Year	Production (DWT)	Number of Worker	Number of Accident	Number of Death	Death Rate
2000	88500	5000	76	4	0.08
2001	147130	5750	61	1	0.02
2002	84700	13545	73	5	0.04
2003	106450	14150	68	3	0.02
2004	293229	14750	120	5	0.03
2005	331741	24200	146	9	0.04
2006	556285	28500	170	10	0.04
2007	670000	33480	227	12	0.04
2008 (first 6 months)	1007968	34500	6	13	

The work of Tezdoğan and Taylan (2009 cited by İşlek, 2010) gives fatal accident rates in world shipyards. These accident rates are shown in Table 10.

Table 10: *Fatal accident rates in world shipyards (Source: İşlek, 2010)*

Countries	Accident Rate (in ten thousand)
Sweden	1
UK	1
USA	2
Japan	3
Singapore	10
Taiwan	10
China	10
Malaysia	12
Turkey	3

It will be easier to implement OHSMS if we understand what work accidents are in shipyards.

These accidents can be listed as follows:

- Falling from high
- Electric shock
- Material crash and fall
- Explosion
- Jamming

As seen in statistics and studies, shipyards are dangerous environments. Therefore, proper OHSMS is essential. A properly prepared OHSMS creates both customer satisfaction and a corporate image.

3.1.4. Examining the Relationship Between Systems

To understand and implement IMS, it is necessary to compare different systems and to know the differences and common features of these systems. The main beneficiaries and focal points of these systems are different (OECD, 2005). However, despite the different focus

points, the systems are part of a top management (Eryaşar, 2011). Domingues et al. (2015) summarized the fundamental concepts of the three systems in a Table 11.

Table 11: *Fundamental concepts of the 3 systems (Source: Domingues et al., 2015)*

Standard	Fundamental concepts							
	Focus	Structural concept	Involvement	Approach	Management	Philosophy	Decision making	Relationship benefit
ISO 9001	Customer	Leadership	People	Process	System	Continuous improvement	Based on evidences	Suppliers and customers
ISO 14001	Society							Society
OHSAS 18001	Employees							Employees

All management systems have certain accepted principles. These are: commitment and policy, planning, implementation, measurement and evaluation, management review and development. These principles have been recognized worldwide. At the core of these are the Deming cycle (Rebelo et al., 2014). The Deming cycle and the harmonization of management systems both facilitates integration and requires similar actions for the three systems. Rebelo et al. (2014) talked about a compatibility matrix for these systems. This matrix is very similar to the IMS matrix described in Section 4. In this matrix, common elements of three systems are shown with the PDCA cycle. This matrix is shown in Appendix 1 at the end of the thesis to keep the flow of the text intact.

When implementing integration, it is useful to clearly state the differences of the systems. There are important differences between QMS, EMS and OHSMS, and Capeles explained these differences briefly and clearly with the help of a table (Table 12) (2002 cited by Almeida et al., 2014).

Table 12: *Differences between QMS, EMS and OHSMS (Source: Almeida et al., 2014)*

	ISO 9001:2008	ISO 14001:2004	OHSAS 18001:2007
Purpose	QMS continuous improvement and customer satisfaction	Support environmental protection and pollution prevention	Control risks and improve performance
Focus	Customers	Society	Collaborators
Scope of application	Products and services	Environmental aspects (includes desired and undesired products and services and resources utilisation)	Occupational risks to safety and health of collaborators
Scope of activities covered	Internal application by organisations. QMS effectiveness meeting customer requirements	All processes and activities of an organisation with environmental aspects	All activities associated with quantifiable occupational risks

As a fundamental difference, we can also mention legislation and laws. While many countries have laws for safety, health and the environment, they are not available for quality.

The systems have common points as well as their differences. These three systems show great similarities both in terms of content and implementation (Eryaşar, 2011). QMS, EMS and OHSMS are based on the continuous improvement approach and these systems think that the investments will return to the business positively. The relationship with the suppliers is important for all three systems. These systems can be applied together in each sector or separately. 9001, 14001 and 45001 standards belonging to ISO have always been developed in compliance. In addition, OHSAS 18001, created after quality and environmental standards, was developed in accordance with the other two standards. The concepts of protection of the outer environment in ISO 14001 and protection of the inner environment in OHSAS 18001 are also included in the field of QMS (Eryaşar, 2011).

3.2. Features and Benefits of IMS and Challenges in IMS Implementation

In this section, features of IMS, reasons for its implementation, benefits and challenges/barriers encountered in IMS applications will be explained. Many authors and researchers have expressed their views on these issues (Griffith, 2000; Von Ahsen and Funck, 2001; De Oliveira Matias and Coelho, 2002; Zutshi and Sohal, 2005; Bobrek and Sokovic, 2006; Jørgensen et al., 2006; Eryaşar, 2011; Zeng et al., 2011; Bernardo et al., 2012; Sampaio et al., 2012; Almeida et al., 2014; Olaru et al., 2014; Rebelo et al., 2014; Muzaimi et al., 2017). Although there are variations among these thoughts, not many different and opposite thoughts have been put forward and they all have emphasized the same points in general.

3.2.1. Main Features of IMS

IMS is a management system like these and has distinctive features. There is a strong relationship between QMS, EMS and OHSMS, and the basic features of IMS emerge from this relationship (Griffith, 2000).

The main features of an IMS can be listed in Table 13 (Eryaşar, 2011):

Table 13: *Main features of IMS*

All processes and systems of the organisation are discussed.
There is full compliance in the organisation.
It does not depend on a specific management standard or law.
There may be full integration for each component.
Various integration models and levels are available.
Requests of all stakeholders are met.
Organisation policy is determined with a common vision within the scope of quality, environment, and health and safety.
Integrated audit is available.
Process controls are carried out in which opportunities and risks are identified simultaneously.
Procedures, guidelines and all administrative processes depend on a single documentation.
Every change in the organisation follows the same formal process.
Decisions are integrated systematically and comprehensively.

Besides these basic features, companies also have expectations from IMS (Eryaşar, 2011):

- IMS should maximize organizational efficiency while minimizing the risk of stakeholders.
- Risks should be identified, and action should be taken.
- The regulation should be understandable.
- Top management should be more active.
- The duties of the employees should be followed in an integrated manner.
- Organizational structure and company priorities should not be forgotten.
- Integration must keep up with changing conditions.

3.2.2. Reasons of IMS and Benefits of Integration

The aim of integration is to establish a more effective and efficient system (Bobrek and Sokovic, 2006). De Oliveira Matias and Coelho (2002) also emphasized the necessity of integration in the study, where it explained the benefits of integration.

All organizations have some internal and external reasons for the integration of the systems. Internal reasons relate to organization, finance and employees, while external reasons relate to marketing, customer, sales, legal requirements, stakeholders and competition (Sampaio et al., 2012). To understand these reasons well, it is necessary to examine the benefits of IMS successfully implemented because these reasons are related to benefits. In Table 14, these benefits are summarized in a general way.

Table 14: Benefits of IMS

Repetitions and unnecessary effort are eliminated.
Sharing information becomes easier and more.
Paperwork and communication are easier.
The institutional structure strengthens.
The organizational structure expands.
Fuzzy management boundaries between individual systems are reduced and the relationship between systems is strengthened.
System performance is increased by reducing process deficiencies, accidents and pollution.
With integration, both application and operating costs are reduced.
The number of multiple audits is reduced, and audits become simpler.
The motivation of the employees increases.
Cross functional framework develops.
Customer confidence increases.
Bureaucracy and paperwork are reduced.
Source and time optimization are done.
Targets are coordinated.
Responsibilities are determined under one roof.
Documentation and records are minimized.
It is ensured that processes are managed effectively and efficiently.
Multi-headedness disappears.
It enables power to be engraved in competition.
It provides flexibility for the inclusion of other systems.
It creates extra added value for businesses.
It increases environmental and health sensitivity.
The effort required to maintain systems is reduced.
Controls become more efficient.
The focus of work improves.
Requirements are met more easily.

3.2.3. Barriers / Challenges Encountered in IMS Implementations

There may be various barriers to integration. Companies that implement systems separately may not be looking for change. The transition to integration scares some companies (De Oliveira Matias and Coelho, 2002). This fear creates resistance against integration and prevents IMS from succeeding.

It is up to companies to simplify the integration. However, if integration cannot be controlled and implemented correctly, it can make bureaucracy more complicated. Therefore, it is

necessary to be realistic and to understand the structure of the organization well while implementing the integration (De Oliveira Matias and Coelho, 2002).

Zeng et al. (2011) and Sampaio et al. (2012) divide the challenges into internal and external. According to them, internal challenges can be listed as human resources, organizational structure, corporate culture and understanding and perception. On the other hand, external challenges are listed as technical guidance, certification bodies, stakeholders and customers, and the institutional environment. In survey of Zeng et al. (2011), the most important internal challenge was the lack of human resources, while the most important external challenge was technical guidance.

Challenges to the implementation of integrated management systems can be specified as in the Table 15:

Table 15: *Challenges of IMS*

The lack of strategic plan and expertise affects system success.
Systems cannot be added to each other with the copy-paste logic. In this case, harmony and success cannot be achieved.
If departments adopt systems at the same time, it can increase the risk of error.
During the integration, one or more of the systems may remain in the background. This situation will create deficiencies and lead to negligence in their responsibilities.
Failure of the company to adopt an integrated culture both increases workload and cost and lowers motivation.
Lack of sufficient financial support is an obstacle.
Employee awareness and education is one of the challenges.
Failures may occur due to consulting activities.
Lack of people and materials poses great difficulties.
Lack of experience leads to malfunctions.
It is not easy to change the structure to what exists within the organization.

Moreover, Bernardo et al. (2012) revealed that lack of government support and human resources are the most important challenges because of their work with companies they have determined in Spain.

4. Integrated Management System Models

This section presents IMS models that are most preferred by organizations and especially include QMS, EMS and OHSMS. The IMS models and detailed explanations reached because of the literature review are given below. The evolution model, ISO 14001 based model, ISO 9001 based model, system approach and TQM model will be explained, respectively. Then, other models will be briefly mentioned, and the models will be compared.

4.1. Evolution Model

The evolution model can be considered as a diagram that includes all other models. Originally devised by Renfrew and Muir (1998), the model was cited in Rasmussen (2007), who argued that different integration models can be categorized according to this model. The evolution model describes the natural development of integrated systems (Olaru et al., 2014). The evolution of management systems can be explained in a simple way (Domingues et al., 2015). Thus, system models integrated with this model are more easily understood. The evolution model of Renfrew and Muir (1998) is shown in Figure 6.

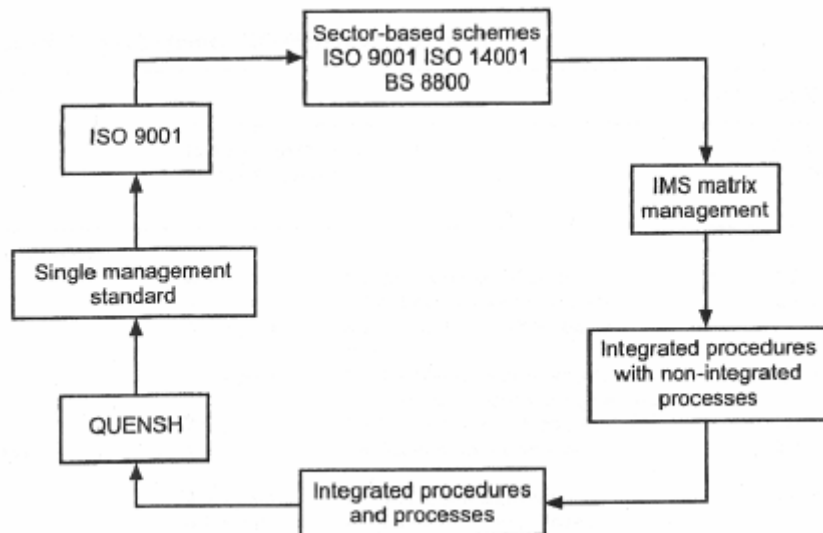


Figure 6: Renfrew and Muir's MS evolution model (Source: Rasmussen, 2007)

The model can be summarized in seven steps. The evolution begins with the emergence of a quality management standard. In this case, ISO 9001 is a good example.

Following the quality management standard, the IMS matrix emerges in the ongoing process of evolution. This shows similar points of matrix management systems. The step after the matrix is the integration of procedures and processes, respectively. Understanding the difference between the procedure and the process is essential for integration. Procedures are documented guidelines used in carrying out different activities within a business. Processes are all the activities that take place within a business. Therefore, while the integration of the procedures consists of documentation, the integration of the processes is operational (Rasmussen, 2007; Eryaşar, 2011). Integration based on ISO 14001 and ISO 9001 as well as the system approach model take place at this stage of evolution.

Renfrew and Muir (1998, cited in Rasmussen, 2007) argue that the next step, QUENSH, is quality-based (total quality management). This is due to the fact that, although quality,

environment, and OHS are integrated, the focus here is on QMS. Hence, the total quality approach belongs to this phase.

Finally, the single management standard marks the end of the evolution. Accordingly, the integrated management system, like other management systems, has a single management standard certified by official institutions. PAS 99 from the UK, DS 8001 from Denmark, and AENOR from Spain are examples for this.

Before moving onto other models of integration, it is necessary to explain the IMS matrix. Since the models discussed in the following sections also include the other evolutionary steps above, those steps will not be emphasized. However, since the IMS matrix in the evolution model is a crucial turning point for integration, it is discussed briefly in the next sub-section.

IMS Matrix

The IMS matrix shows the compatibility of two or more different system standards. Many elements match in the IMS matrix (Eryaşar, 2011). Among the researchers who utilized this matrix are Beechner and Koch (1997), Puri (1996) and Karapetrovic and Willborn (1998). They also focused on the differences of ISO 9001 and ISO 14001 in this matrix.

Muzaimi et al. (2017) uses a matrix containing ISO 9001, ISO 14001, and OHSAS 18001 (see Table 16). The matrix demonstrates the aspects and the sections that all three management systems have in common.

Table 16: IMS matrix (Source: Muzaimi et al., 2017)

ISO 9001	ISO 14001	OHSAS 18001
Scope (1, 4.3)	Scope (1, 4.3)	Scope (1)
General Requirement (4.1, 4.2, 4.4, 4.4.1, 4.4.2, 5.1, 5.1.1)	General Requirement (4.1, 4.2, 4.4, 5, 5.1)	General Requirement (4.1)
Management System Policy (5.2, 5.2.1, 5.2.2)	Management System Policy (5.2)	Management System Policy (4.2)
Planning (6, 6.2, 6.2.1, 6.2.2, 6.3)	Planning (6, 6.1.2, 6.1.3, 6.1.4)	Planning (4.3)
Planning-Risk (6.1, 6.1.1, 6.1.2)	Panning-Risk (6.1, 6.1.1)	
		Identification and evaluation of aspect, impacts and risks (4.3.1)
		Identification of legal and other requirements (4.3.2)
		Contingency planning (4.4.7)
Objectives (6.2, 6.2.1, 6.2.2)	Objectives (6.2, 6.2.1, 6.2.2)	Objectives (4.3.3)
Organizational structure, roles, responsibilities and authorities (5.3)	Organizational structure, roles, responsibilities and authorities (5.3)	Organizational structure, roles, responsibilities and authorities (4.4.1)

Operational control (7.1.4, 8, 8.1)	Operational control (8, 8.1, 8.2)	Operational control (4.4.6)
resources (Clause: 7.1, 7.1.1, 7.1.2, 7.1.3, 7.2, 7.3)	Management of resources (Clause: 7.1, 7.2, 7.3)	Management of resources (Clause: 4.4.1, 4.4.2)
Documentation requirement (7.5, 7.5.1, 7.5.2, 7.5.3, 7.5.3.1, 7.5.3.2)	Documentation requirement (7.5, 7.5.1, 7.5.2, 7.5.3)	Documentation requirement (4.4.4, 4.4.5, 4.5.3)
Communication (7.4, 8.2.1)	Communication (7.4, 7.4.1, 7.4.2, 7.4.3)	Communication (4.4.3, 4.4.3.1)
Monitoring and measurement (7.1.5, 7.1.5.1, 7.1.5.2, 9.1, 9.1.1)	Monitoring and measurement (9, 9.1, 9.1.1)	Monitoring and measurement (4.5.1)
Evaluation and compliance (9, 9.1.2, 9.1.3)	Evaluation and compliance (6.1.3, 9.1.2)	Evaluation and compliance (4.5.1)
Internal audit (9.2, 9.2.1, 9.2.2)	Internal audit (9.2, 9.2.1, 9.2.2)	Internal audit (4.5.5)
Handling of nonconformities (8.7, 8.7.1, 8.7.2)	Handling of nonconformities (10.2)	Handling of nonconformities (4.5.3.2)
Improvement (10, 10.1, 10.3)	Improvement (10, 10.1, 10.3)	Improvement (4.6)
Management Review (9.3.1)	Management Review (9.3)	Management Review (4.6)

The IMS matrix brought with itself questions about how to make use of it. Many researchers thought it was an essential factor for integration. However, when dealing with the IMS matrix, the difference between the integration and alignment of management systems and standards should be considered (Rasmussen, 2007). To do so, Wilkinson and Dale (1999) refer to MacGregor Associates (1996). In MacGregor Associates, integration is regarded as the integration of each related unit, and alignment is the parallelization of the systems using their common aspects. Figure 7 shows integration and alignment.

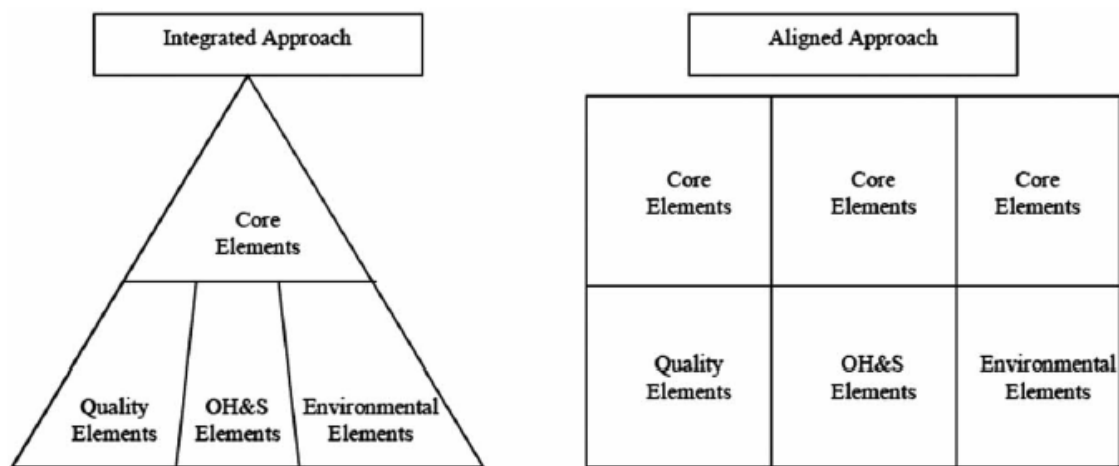


Figure 7: *Integrated and Aligned approach (Source: Wilkinson and Dale, 1999)*

To sum up, IMS matrix shows the great integration potential among common elements between different management systems. This matrix, which can be called the beginning of integration, plays a major role in the evolution of the model (Rasmussen, 2007).

4.2. Integration Model Based on ISO 14001 (With PDCA cycle)

ISO 14001 is one of the quality management systems that can form the basis of IMS (TSE, 2015). It only focuses on environmental aspects due to its structure. Therefore, other management elements should be added to its scope. In this context, the most popular ones

are quality management elements (Rasmussen, 2007). The Integration Model Based on ISO 14001 with PDCA cycle is based on the Deming cycle, and just like the Deming cycle, continuous improvement is the most important feature of the model. In this model, there are five steps corresponding to the steps of the cycle: policy, planning, implementation and operation, control and corrective actions, and management review. The model based on environmental management systems can be seen in Figure 8. As shown in the figure, five steps are explained on the basis of the PDCA cycle (Von Ahsen and Funck, 2001).

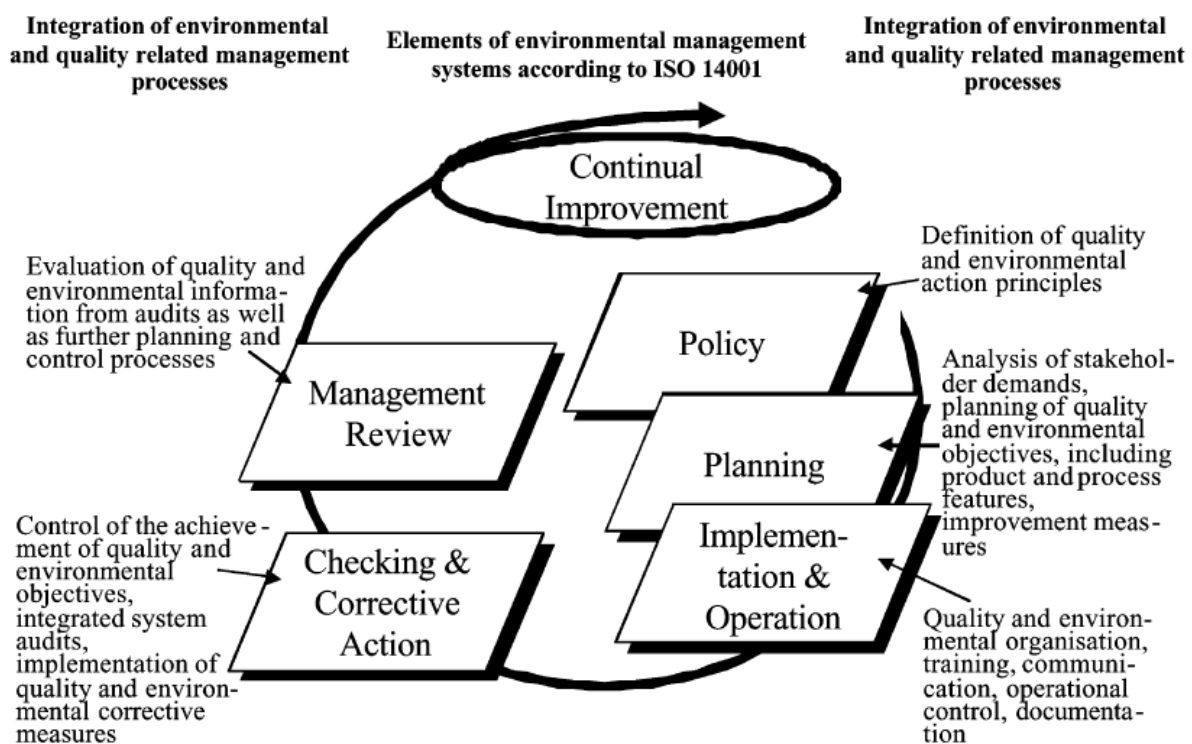


Figure 8: Requirements of an IMS based on the ISO 14001 structure (Source: Von Ahsen and Funck, 2001).

4.3. Integration Model Based on ISO 9001 (With Process Approach)

For many businesses, quality means a lot. Firms therefore prioritize ISO 9001, even though it is not compulsory. QMS is the most used management system within integration. For this

reason, businesses often create integration models based on ISO 9001. For an IMS based on ISO 9001, other management system (EMS, OHSMS etc.) elements must be integrated into quality system elements (Von Ahsen and Funck, 2001). ISO 14001 and OHSAS 18001 currently comply with the requirements of ISO 9001 (Rasmussen, 2007).

The integration based on ISO 9001 is built upon a process approach (Eryaşar, 2011). In this model, which is focused on customer and customer demand, it is necessary to focus on the company's operating product chain (Jørgensen et al., 2006). Figure 9 below summarizes the mentioned model briefly.

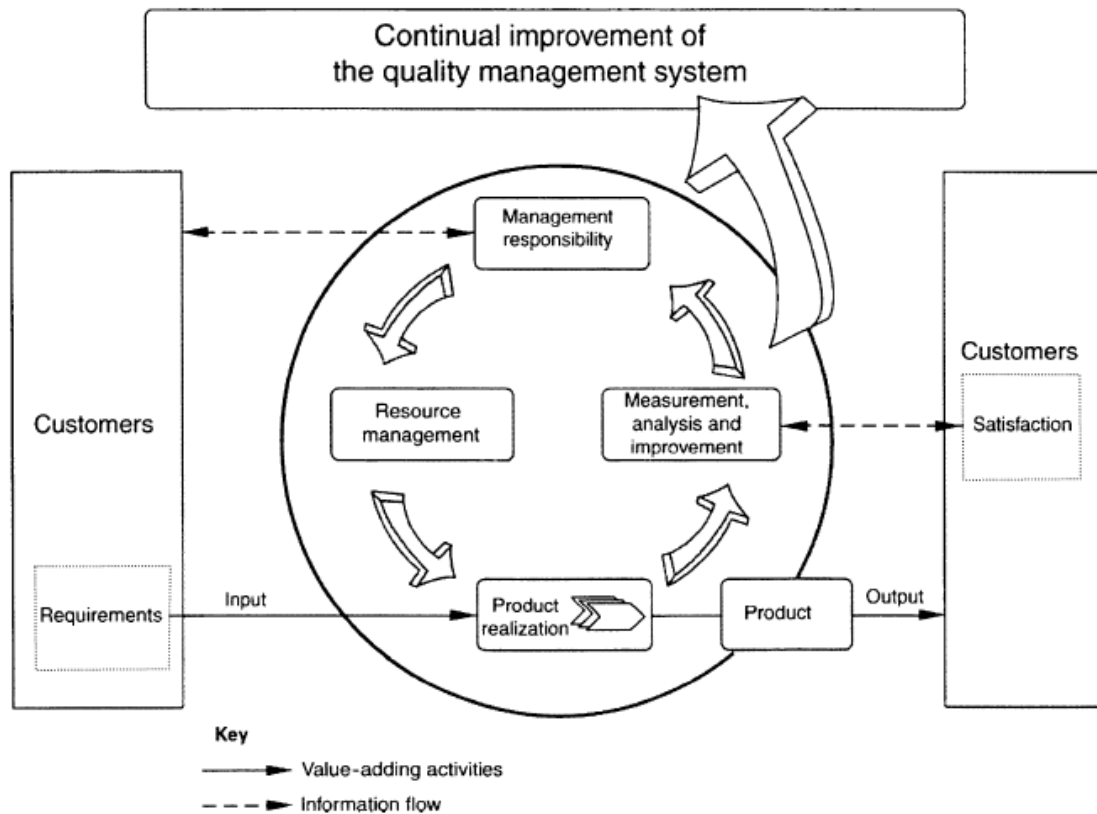


Figure 9: *Integration model based on ISO 9001 (Source: Jørgensen et al., 2006)*

Rebelo et al. (2014) also mention this model and include a schematization similar to that of Figure 9 in their work.

Looking at the figure, we can see that at first, customer requests form the input. The output is the service or product that reaches the customer at the end of the processes. Throughout the processes between input and output, the firm should measure customer satisfaction and strive to improve the process. In fact, the main purpose of ISO 9001 is to increase customer satisfaction (Olaru et al., 2014). In order to better understand the model, it is necessary to understand some basic elements. These key elements are:

- **Management responsibility:** Focuses on management systems in integration and the needs of stakeholders
- **Resource management:** Deals with planning, resource consumption, financial management, and information management.
- **Processes:** The heart of the integration model, covers operational processes.
- **Measurement, analysis and improvement:** Ensures that the outputs are controlled, and corrective and preventive measures are taken if necessary (Von Ahsen and Funck, 2001).

To understand this process approach-based model, it is also necessary to understand the concept of process approach (Eryaşar, 2011). According to the process approach:

- Businesses are organizations consisting of a combination of different departments.
- Businesses have different processes.
- Stakeholders need to have the priority when implementing IMS.
- Basic processes should be determined.
- Systems should be integrated and meet the needs of stakeholders.

4.4. System Approach

A system is a structure consisting of processes that share the same resources and are managed in line with specific goals and objectives (Eryaşar, 2011). The integrated system approach was developed by Karapetrovic and Willborn, following this definition (1998 and 2003 cited by Rasmussen, 2007). In this approach, the aim is to overcome all kinds of differences and match different functions. The system approach is a holistic approach and combines the PDCA cycle and process approach. As it is known, while the process approach examines all processes, PDCA approach aims to continuously improve a process (Rasmussen, 2007). Karapetrovic (2003) argued that these approaches should be combined rather than independently used. According to him, the common elements of all standards should be integrated first, and then the unique and wider requirements should be integrated.

Karapetrovic (2002) thought that integration with the system approach could take different forms. He divided it according to the ways to be followed and the forms of integration.

According to him, integration could be in three forms:

- Integration of documents
- Alignment of key processes, goals and resources
- Creating an "all-in-one" system

Besides these different forms, different ways can be followed when implementing integration:

- QMS first, then others
- EMS first, then others
- QMS and EMS simultaneously, then others
- Installing the IMS core first, then applying the IMS components

The system approach can be summarized as shown in Figure 10.

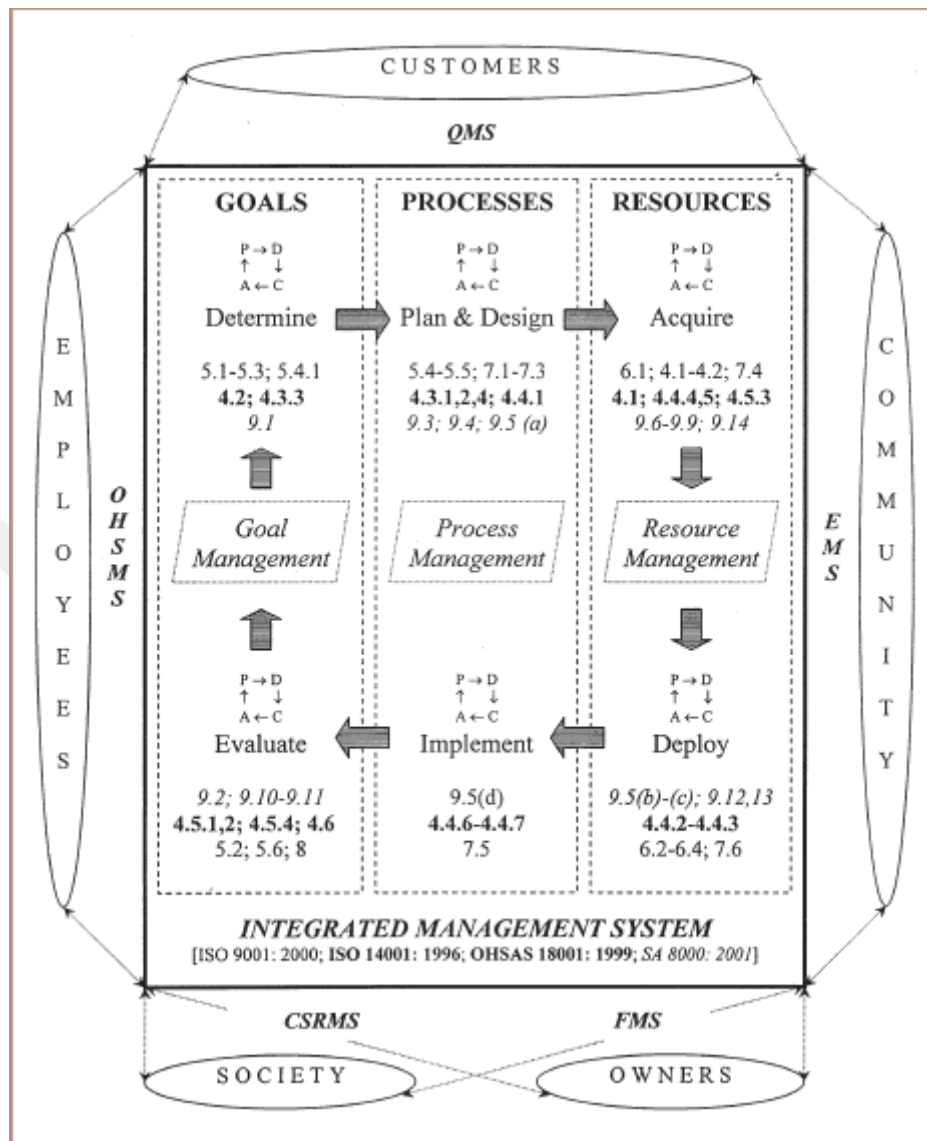


Figure 10: The system approach to IMS (Source: Karapetrovic, 2003)

With this model, homogeneity was achieved (Asif et al., 2010) and balance was achieved between management and objectives, processes and resources (Domingues et al, 2015). As shown in the figure, this model also included the social accountability and financial management system (Domingues et al, 2015). The numbers in the figure represent the subheadings in the management systems.

In the system approach, integration has six main processes:

1. Determine of goals
2. Plan and design
3. The acquisition
4. Deployment of resources
5. Implementation of control
6. Evaluation of goals

Each process is in harmony with the PDCA cycle (Karapetrovic, 2003).

Since the figure was taken from Karapetrovic's work in 2003, an explanation was made on the old revisions of the management systems.

4.5. TQM Approach-EFQM Excellence Model

Dating back to the 1980s, TQM is a concept that has spread to all levels of an organization, integrated into all functions, keeping customer satisfaction at the highest level and aiming to produce high quality products or services. This is broader than the general QMS and addresses operational and strategic levels. TQM has three basic principles:

- Continuous improvement
- Teamwork
- Customer orientation

Due to the changing conditions, businesses pay attention to environmental and OHS issues as well as quality and TQM has a structure that can keep up with changing conditions.

Therefore, the TQM approach focuses on quality, environment and occupational issues

(Rasmussen, 2007). The most well-known of this approach is the EFQM excellence model (Wilkinson and Dale, 1999).

Evaluating the company's progress towards excellence, the EFQM model includes environmental criteria and quality requirements. This model consists of five enablers and four results (Von Ahsen and Funck, 2011).

Enablers:

- Leadership
- People
- Policy and Strategy
- Partnership and Resources
- Processes

Results:

- People Results
- Customer Results
- Society Results
- Key Performance Results

The EFQM model can cover OHSMS and EMS in many ways. In this context if we examine the enabler:

- Leadership is about understanding environmental actions.
- People is about the environmental awareness of employees.
- Policy and strategy are about understanding environmental actions.
- Partnership and resources are about consumption of resources

- Processes are about to the implementation of management systems.

If we examine the results:

- Customer result is about the perception of the company's environmental profile by the customer.
- People result is about employee satisfaction with environmental policy.
- Society result is about pollution that affects society.

The general state of the EFQM model and the weight of inputs and outputs (Wilkinson and Dale, 1999) are shown in Figure 11.

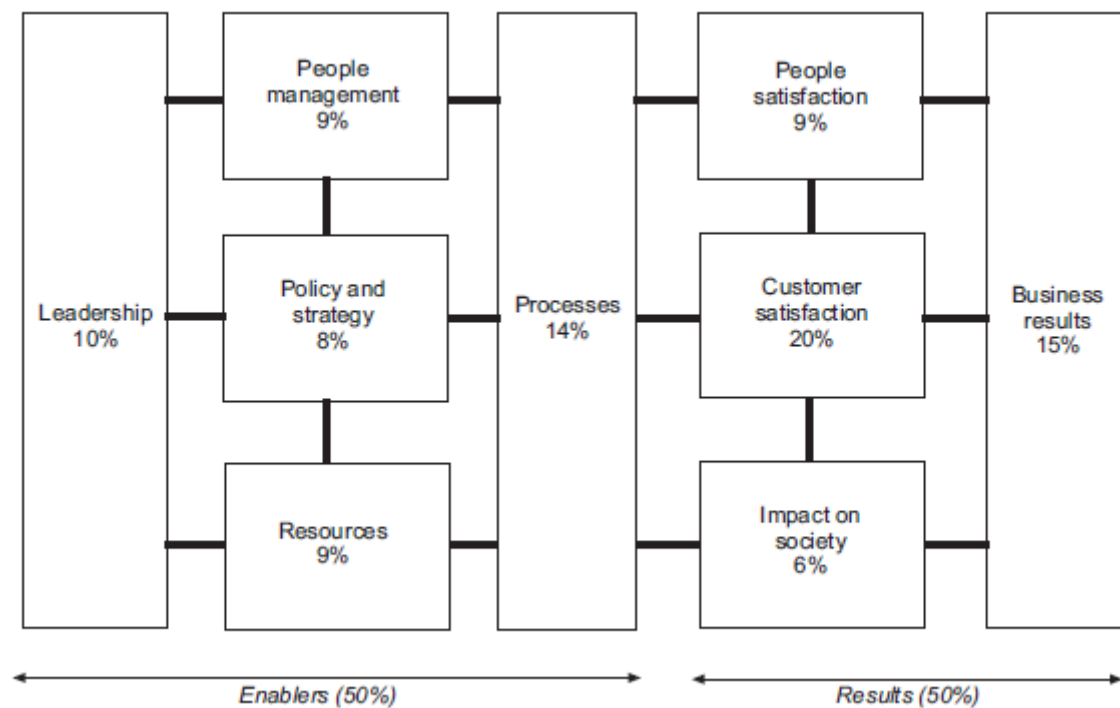


Figure 11: The general state of the EFQM model (Source: Wilkinson and Dale, 1999)

Across this model, the EFQM model may not fully meet the certification requirements of the standards (Wilkinson and Dale, 1999). Also, in this model, environmental and OHS targets are intermediate targets. This can have negative effects (Von Ahsen and Funck, 2001).

According to Von Ahsen and Funck (2001), the EFQM model does not have a complex structure compared to ISO based IMS models. ISO-based models can be disadvantageous in this respect as they have many processes.

4.6. Other Models

In addition to the models described, many researchers presented different models. Zeng, Shi and Lou (2007) suggested the synergistic model. This model, whose work has emerged in China, is based on the potential synergy between management systems. Rajkovic, Milicevic and Malbasic have proposed a model for quality SMEs that includes quality, environment and OHS (2007 cited by Domingues et al., 2015). Rebelo and Santos have developed a model where the Shewart PDCA cycle is at the centre and this cycle is applied to each stage (2014 cited by Domingues et al., 2015). Lobodova (2004) proposed a model based on OHSAS 18001. While this model consists of 7 steps, IMS gets support from risk management approach. According to this model, the focus is not QMS. OHSAS 18001 plays a key role in developing stakeholders' risk assessment philosophy. Asif et al. (2009) developed a methodology called PEDIMS (Process Embedded Design of Integrated Management System). Accordingly, processes should start with the design of the central process and then integration should be implemented. In 2010, Asif et al. Talked about the techno-centric approach. This approach provides operational level benefits to the integrated system.

4.7. Comparison of the Models

The models examined are compared in Table 17. Each model has its own purpose, characteristic, scope and limit.

The IMS matrix eliminates duplicates thanks to the integration of common points. Even if Matrix is the basis of integration, it will not be enough to see it as a stand-alone model. Also, this matrix does not address cultural issues. The IMS matrix is based on the process approach and the PDCA cycle at the beginner level (Eryaşar, 2011).

Although the system approach is seen as a successful model, it does not include cultural issues. The EFQM model may be a suitable model, but, as mentioned earlier, it cannot fully meet the standards of management systems (Rasmussen, 2007). The only IMS that is the last step in the evolution model of Renfrew and Muir may be suitable for IMS. However, there is no international standard for this. As mentioned earlier, these studies remained on a country basis.

Table 17: *Characterisation of different IMS models regarding scope, model characteristics, purpose (Source: Rasmussen, 2007)*

Model	Scope	Model characteristics	Purpose	Limitations
IMS Matrix	The standards themselves.	Harmonisation of the elements in the standards.	Show combinability.	Aligned not integrated.
Integration of common elements	The common elements.	The integration of common elements.	Avoid duplication.	Aligned not integrated.
Integrated Documentation	The documentation.	One management handbook for all systems.	Simplify and reduce documentation.	Aligned not integrated.
ISO 14001 based IMS	The requirements in the standards.	An IMS based on the PDCA circle.	An IMS based on the PDCA circle.	Ignores culture.
ISO 9001 Based IMS	The requirements in the standards.	An IMS based on the process approach.	An IMS based on the process approach.	Ignores culture.
The System Approach	The requirements in the standards.	An IMS based on both the PDCA circle and the process approach.	To avoid the problems regarding to different underlying models.	Ignores culture.
EFQM model	Total Quality Management.	Includes strategic and 'cultural' management.	Business Excellence.	Do not address the ISO certification requirements.
The single Management standard	The standards themselves.	Based on only one common standard.	'One company, one system'.	ISO not exists, potentially inflexible, must be regularly updated.

5. The Study: IMS in Turkish Shipyards

This section contains the results of a quantitative survey of shipyards in Turkey. This study shows the status and benefits of IMS in shipyards and the obstacles that arise when implementing IMS. Due to the COVID-19 pandemic causing, the survey was conducted online. Even though the desired efficiency was not achieved due to the online survey, this study enabled us to make correct inferences about the IMS in the shipyards. In the first part, the content of the questionnaire will be explained. This will be followed by a discussion of the results. Then, the results will be compared with the IMS features in Section 3. Finally, in Section 4 the integrated system models at the shipyards will be examined in light of the models presented.

5.1. Content of the Research Questionnaire

The Research questionnaire (see Appendix 2 for all questions) was generally adapted by Rasmussen's (2007) study. However, since it is a survey specific to shipyards, the company's field of work was not included in the questions, and the question related to the DS 8001: 2005 standard in Denmark was removed. The survey consists of 17 questions and an optional comments section.

The first three questions are about the company and the individual answering the questionnaire. The year of establishment of the company, the position of the person answering the questionnaire and the number of people working in the company are established with these questions.

The next two questions find out the certificates owned by the companies and the years they obtained these certificates. The purpose of these questions is to learn which management systems (QMS, EMS and/or OHSMS) companies have.

The sixth question is of great importance for the study since it asks whether there exists an integrated management system in the companies surveyed.

The seventh and eighth questions are related to the existing integrated system's content and its implementation start date. The seventh question aimed to see which systems the companies integrated into their IMS. For example, some companies choose to apply the OHSMS individually while integrating quality and environment.

The ninth question deal with what assistance elements are used by shipyards when implementing IM. The question aimed to find the ways shipyards in Turkey apply the integration processes. In the following question, respondents were presented with two options: initial integration in one go or implementation of systems separately and then integration. With this question, the integration strategy of the shipyards was determined.

The eleventh question enquired about the integration model. The models in the question are the most frequently used models for integration the world. These models are described in detail in Section 4. The question provided an "Other" option with a comment section, in case a respondent used an unlisted integration model.

The twelfth question sought information about the integrated elements. Similar to the previous question, there was a comment section for unlisted elements. The next question was about the level of integration and it asked whether the shipyards had fully integrated all systems. The following three questions asked about the benefits and disadvantages of the integrated system and the obstacles the respondents faced while implementing IMS.

In the final question, the participants were asked whether they would like to obtain an international certificate of integration.

In the next section, the answers to these questions will be comprehensively analysed and statistical data will be presented.

5.2. Survey Results

The questionnaire was delivered to a total of 47 shipyards and 18 of these companies participated in it, which comes to 38.3% participation rate. 17 out of 18 shipyards included in the survey implemented IMS. Rasmussen (2007) and Sampaio et al. (2012) determined IMS application rates of 91% (in Denmark) and 85% (in Portugal) respectively in their studies. Based on these two studies, this survey, which produced a 94% result, is in line with the countries above.

5.2.1. The Profile of Shipyards Participating in the Research

All the shipyards surveyed are located in the Istanbul Shipyards Region. Some of them are privately owned whereas others are financed by the government. Although the management of the shipyards is independent, they belong to an organization called the Shipbuilders Association (GiSBiR). The shipyards in the survey had different establishment years as well as different numbers of employees.

The shipyards were then categorized into small, medium, or large-scale enterprises according to the number of employees. Table 18 shows the number of employees in the enterprises, while Table 19 shows the years of establishment of the shipyards.

Table 18: *Number of small, medium and large enterprises participating in the study*

Small Sized Shipyards (<100 employees)	Medium Sized Shipyards (<500 employees)	Large Sized Shipyards (<2500 employees)
3	11	3

While 3 shipyards have 100 or less workers, 11 shipyards have between 100 and 500 employees. 3 shipyards have between 500 and 2500 employees, and finally, 1 shipyard employs more than 10000 workers.

Table 19: *The years of establishment of the shipyards.*

Year	1885	1956	1969	1970	1975	1978	1980	1982	1985
Number of Shipyards	1	1	1	1	1	1	1	1	1
Year	1988	1989	1993	1997	1999	2007	2008	2009	2010
Number of Shipyards	1	1	1	1	1	1	1	1	1

The 18 shipyards participating in the survey were established between the dates of 1885 and 2010.

5.2.2. Management Systems Used by the Shipyards

As stated earlier, it was determined that 17 of the 18 shipyards participating in the research were using an IMS. Table 20 shows which systems these companies have had integrated.

Table 20: *Combinations of integrated management systems*

Management Systems	Number of Shipyards	Percentage of Shipyards
QMS (ISO 9001), EMS (ISO 14001), OHSMS (OHSAS 18001)	9	52.90%
QMS (ISO 9001), EMS (ISO 14001), OHSMS (ISO 45001)	2	11.80%
QMS (ISO 9001), EMS (ISO 14001)	4	23.50%
QMS (ISO 9001), OHSMS (OHSAS18001)	1	5.90%
QMS (ISO 9001), EMS (ISO 14001), OHSMS (OHSAS 18001), CSMS (ISO/IEC 27001), ISMS (ISO 10002)	1	5.90%

Most of the shipyards (64.7%) participating in the research are using QMS, EMS and OHSMS integration. This result coincides with the results obtained previously in literature. For example, Bernardo *et al.* (2010) found parallel results. However, there are some points to note here:

1. Nine of the companies using these three basic management systems use OHSAS 18001 for OHSMS. The other two use ISO 45001 for OHSMS.
2. In addition to integration, one of the nine shipyards mentioned above uses ISO/IEC 27001 as an Information Security Management System (ISMS) and ISO 10002 as a Customer Satisfaction Management System (CSMS). These two systems are not included in the integration and are used individually. Furthermore, another company

uses ISO/IEC 27001 as an ISMS, on top of the IMS implementation of the aforementioned three systems.

3. Four shipyards integrate quality and environmental management systems while one additionally uses ISM, and another additionally uses OHSMS (ISO 45001).
4. One shipyard has only integrated quality and OHSMS.
5. As one of the striking results of the survey, one of the shipyards included five existing systems in the integration: QMS, EMS, OHSMS (OHSAS 18001), CSMS and ISMS.

Looking at these results, we can say that companies can use individual systems as well as integration. All the systems in a company can be included in the integration, while some of them can be applied independently, except for integration. Finally, we can easily argue that for the participating shipyards, QMS is indispensable for integration.

5.2.3. Year and Strategy of the Integration Implementation

Table 21 illustrates the IMS implementation dates of shipyards. Compared to the establishment years of the shipyards, most of them started to implement IMS years after they were established. We can state in particular that the interest in IMS has increased after 2000. As can be seen from Table 21, three shipyards were not willing to share their IMS implementation dates in the survey. Therefore, this question was answered by 14 shipyards in total (82.3%). Among the 14 shipyards that responded, 12 of them started IMS implementation after 2000 (85.7%). In addition, only two shipyards started integration at the time of their establishment.

Table 21: *Years of shipyards participating in the research to start the IMS implementation*

Year	1985	2000	2006	2008	2009	2010
Number of Shipyards	2	1	1	1	1	2
Year	2014	2015	2016	2017	2018	
Number of Shipyards	1	2	1	1	1	

As explained in the literature review, integration has two different implementation strategies. Firms can initially integrate varying management systems at once, or they can implement these systems separately and then proceed to merge them. According to Figure 12, there is an even distribution in the integration implementation strategies of the shipyards. 8 out of 17 shipyards implementing integration fused all management systems contiguously.

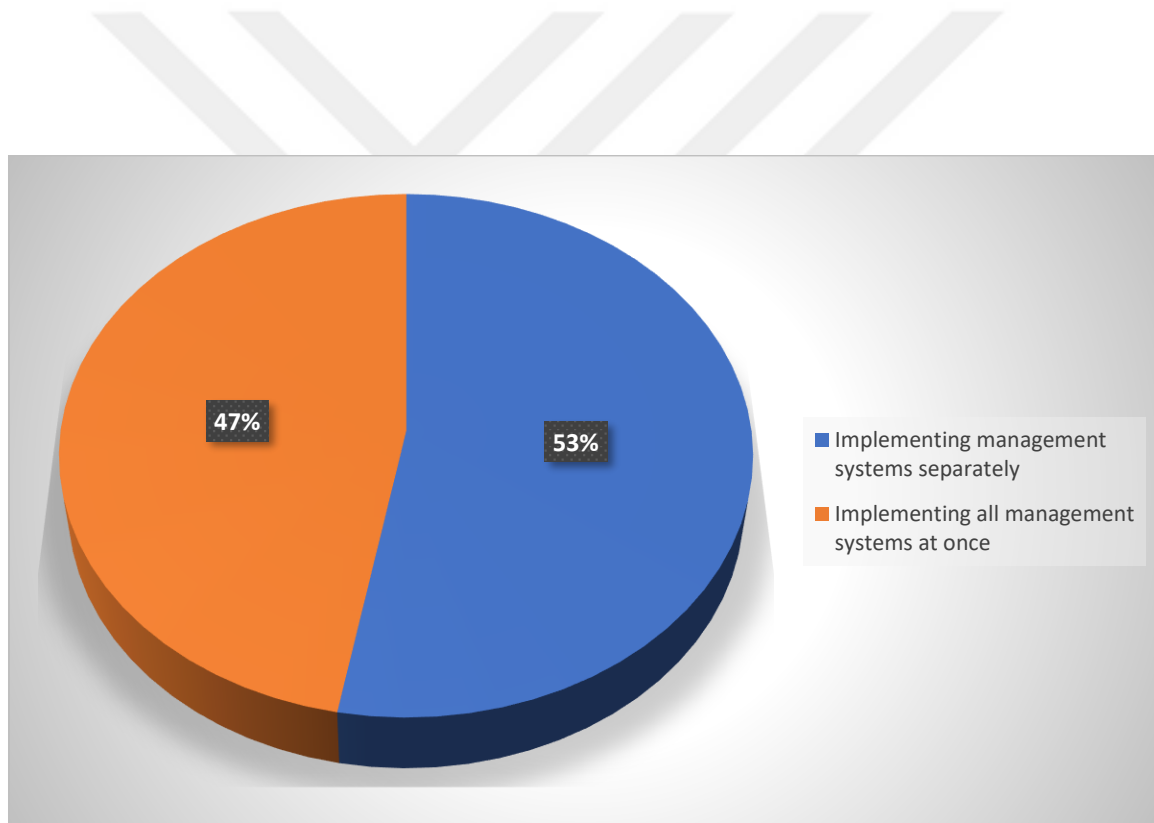


Figure 12: *Distribution in the integration implementation strategies of the shipyards*

5.2.4. Preferred IMS Models by Shipyards

IMS models are mentioned briefly in the literature review and in detail in Section 4. Shipyards were asked which model they preferred when implementing integration within the scope of these models. Figure 13 presents the distribution of preferred models.

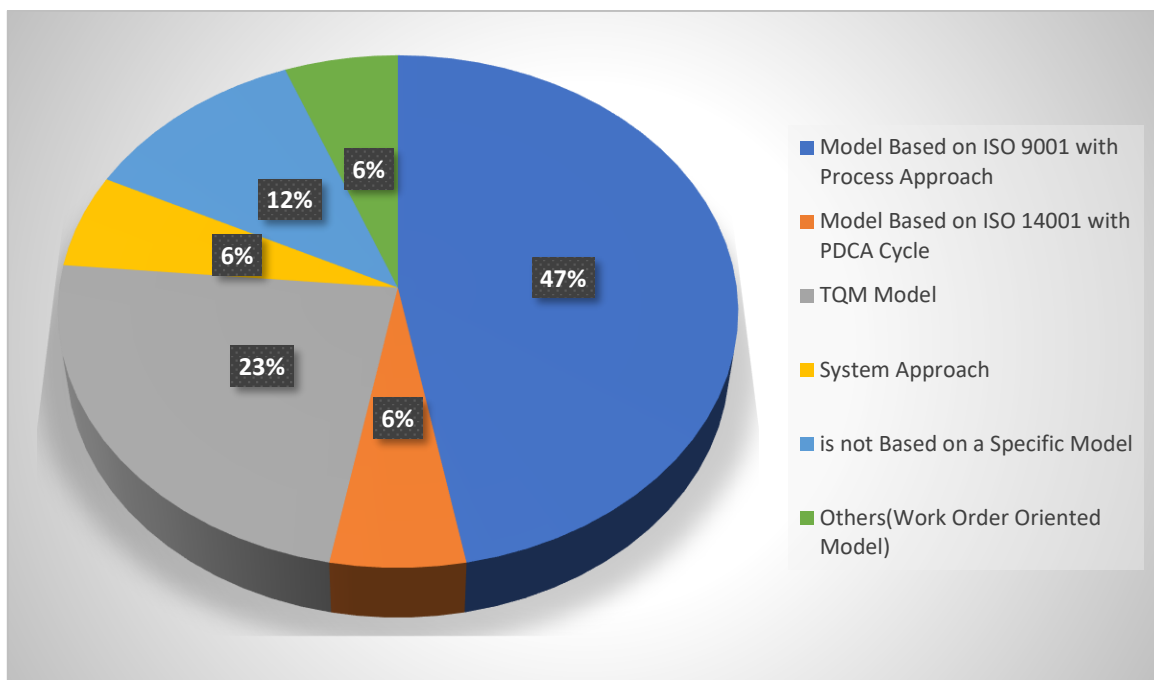


Figure 13: *Distribution of preferred models*

Most shipyards surveyed opted for a quality-based integration (8). Quality is of utmost value since large scale production is routinely carried out in shipyards. The result is supportive of this fact. Furthermore, the fact that ISO 9001 is older than others is one of the factors that lead to this outcome. We can see that the 4 shipyards participating in the research have turned towards an integration, based on Total Quality Management. Moreover, the two shipyards stated that they were not using a specific model. One shipyard preferred the ISO 14001 based on PDCA model and one shipyard opted for the system approach-based model. However, one

shipyard dismissed these models and referred to using a different one (Work Order Oriented Model). This model, which has not been encountered in the literature review before, is based on work order.

Hence, one can inference that the results corroborate the literature and earlier studies. As it is evident from the variety of models in attested shipyards, there is not a single definite and clear model and implementation method for integration. Due to the IMS structure, companies should design or choose models that are suitable for their business and suitable for their work areas and goals. Shipyards participating in the survey chose the most suitable model in line with their goals, opportunities, and requirements.

5.2.5. Types of Assistance in the IMS Implementation

The assistance received by the shipyards participating in the research and using IMS while applying integration is shown in Table 22. The types of assistance that can be received while carrying out integration were listed, and companies were asked to choose one or more kind(s). These options can be enumerated as guidelines of companies that have previously implemented IMS, consulting companies, experiences of companies implementing IMS, certification bodies, and classification societies.

Table 22: Assistance types received when switching to IMS implementation

Types of Assistance	Number of Shipyards	Percentage of Shipyards
Other companies' IMS guidelines	5	30%
Consulting companies	12	71%
Experiences of other IMS implementers	4	24%
Certification bodies	9	53%
Classification society and a conformity assessment organisation	8	47%
No Assistance	0	0

The diversity of answers supports the conclusion that there is no single integration model and method. Each shipyard has chosen its own assistance appropriate to their operations. It is observed that most shipyards turn to consultancy companies for integration implementation (71%). Furthermore, it is possible to talk about a balanced distribution. However, second to consulting companies, classification societies and certification organizations are generally preferred. All participating shipyards have chosen at least one assistance option. As can be seen from the table, no company has opted for the option that they received no assistance at all. This purports that it is quite challenging to properly implement integration without a roadmap, a guide or any sort of help.

If we look at the percentages, it can be deduced that the sum exceeds a hundred which means that shipyards often did not receive any assistance. For instance, some shipyards received assistance from classification societies and consultancy companies, while others obtained help from consultancy companies, IMS guidelines and certification bodies.

5.2.6. Elements Integrated Under IMS

Table 23 shows which elements the shipyards have integrated.

Table 23: *Integrated elements in shipyards implementing IMS*

Integrated Elements	Number of Shipyards	Percentage of Shipyards
Procedures	15	88%
Internal audits	15	88%
Objectives	14	82%
Training	14	82%
Policy	13	77%
External audits	13	77%
Internal communication	13	77%
Management handbook	12	71%
Corrective and preventive actions	12	71%
Management review	12	71%
Distribution of resources	11	65%
Decision-making process	11	65%
Management of documentation	11	65%
External communication	10	59%
Organisation	9	53%
None of them	1	6%

According to the results, shipyards behaved similarly when integrating the elements, however, some changes seem evident in line with the goals and requirements. More than 80% of shipyards have integrated procedures, internal audits, objectives and training. Policy, external audits, internal communication, management handbook, regulatory and preventive actions, and management review have been integrated by more than 70%. 65% of the participants included the decision-making process, the distribution of resources and the management of documents in the integration. Only organization and external communication remained between 60% and 50%. Another striking point is that only one shipyard has not selected any

option. This company, unfortunately, has not made any comments on this issue, yet it can be said that they bring another perspective to integration.

The results obtained at this stage support the literature review. Although the working areas of the companies examined are various, the integrated elements show similarities.

5.2.7. The Benefit of IMS to Shipyards

Table 24 shows the benefit IMS provides to shipyards. As can be seen, having an integrated system provides multiple benefits for shipyards. 82% of the respondents stated that there was better coordination between management systems. 71% of the shipyards participating in the research reported that integration leads to a greater focus on the environment, another 71% reported the same effect on the quality, and 53% reported the same effect on occupational health and safety. This result is significant because we questioned whether there is a change in the focus of shipyards after integration. Compared to other fields of work, one of the business areas with the highest mortality rate is the shipbuilding sector. Therefore, OHS is a priority in shipyards at present. The 53% that came up from this survey supports this concern which displays that the focus has not changed much in terms of occupational health and safety.

Table 24: The benefits of IMS

The Benefits of IMS	Number of Shipyards	Percentage of Shipyards
There is a better coordination between different management systems	14	82%
There is more focus on quality	12	71%
There is more focus on environment	12	71%
The time consumption for internal audits is reduced	10	59%
The time consumption for external audits is reduced	9	53%
There is more focus on OHS	9	53%
There is less conflicts between different management systems	9	53%
The time consumption for management is reduced	8	47%
The documentation is simpler	8	47%
There is increased innovation	8	47%
The management cost is reduced	6	35%
The documentation scope is narrowed	3	18%
There is no benefit	1	6%
There is no benefit	1	6%

59% of participating shipyards reported a benefit in reduced internal audits, while 53% disclosed gains such as reduced external audits and minimised conflicts between management systems. 47% of the shipyards stated that the time required for management decreased, innovation increased, and documentation was simplified. In general, multiple benefits have also been mentioned with regards to saving time leading to increased productivity for the shipyards. This means increased productivity for the shipyards. At the same time, shorter time means shorter delivery time to the customer which, in turn, affects customer satisfaction. 35% and 18% of the respondents stated respectively that the management cost decreased, and

the scope of documentation has narrowed. There are two other important points to be highlighted in these results:

- Apart from these benefits, one of the shipyards stated another benefit of its own. This firm stated that the tasks and workload are now more clearly defined.
- Another shipyard argued that they were reaping no benefit. He stated that the reason was that the employees did not adopt the program, strategy, and logic and that the top management continued to work following the usual order.

These results largely overlap with the benefits of IMS in Section 3 and literature review. Zeng et al. (2011) and Almeida et al. (2014) also demonstrated similar benefits in their studies. Also, if we look at Rasmussen's study (2007), it is possible to see similar results. The most stated benefits in his study were the simplification of documentation and the increased harmony of systems.

5.2.8. Integration Challenges and Disadvantages

Table 25 presents the challenges/barriers encountered when implementing integration. Three of the 17 shipyards implementing integration stated that they did not encounter any barriers (18%). The most important barrier is the lack of knowledge (65%). Difficulties in organizational change and hinderances in focusing on different areas rank second and third, respectively 59% and 47%. 41 percent of the shipyards reported that they encountered a shortage of resources. Zeng et al. (2011) and Bernardo et al. (2012) emphasized that the most significant barrier, like many other researchers, is the lack of human resources. The result obtained from this survey contradicts the results of these researchers. Lack of resources encompasses the human factor. Here, we can attribute the reason for the contradictory result to enough people working in the shipyards. Finally, 29% of shipyards complained of insufficient motivation. Furthermore, a

shipyard added another barrier they experienced at workplace: The inability to give up old habits. Examining the percentages, it can be deduced that a shipyard does not only encounter a single obstacle. Generally, the difficulties encountered are not insurmountable. In particular, lack of knowledge, resources and motivation are barriers that can be overcome with the necessary support and training.

Table 25: *Challenges encountered in IMS implementation*

Challenges/Barriers	Number of Shipyards	Percentage of Shipyards
Lack of knowledge	11	65%
Difficulties in organisational changes	10	59%
Difficulties in focusing on different areas	8	47%
Lack of resources	7	41%
Lack of motivation	5	29%
There are no challenges/barriers	3	18%

Table 26 illustrates the disadvantages that occur after IMS implementation. Most of the participating shipyards stated that they did not experience any disadvantages as expected in study (76.5%). As stated in the literature review, the purpose of integration is to eliminate the disadvantages and to provide benefits to the company. Yet, according to the results in the survey, some shipyards have indeed encountered some disadvantages. While 18% of the shipyards stated that the documentation has become more complex, 12% stated that the management has been rendered rather convoluted. Shipyards did not experience any disadvantages regarding quality and OHS, but 1 shipyard (6%) claimed less focus on the environment.

Table 26: *Disadvantages related to the IMS implementation*

Disadvantages	Number of Shipyards	Percentage of Shipyards
The documentation is more complex	3	18%
The management is more complex	2	12%
There is less focus on environment	1	6%
There is less focus on Quality	0	0%
There is less focus on OHS	0	0%
There is no disadvantage	13	77%

5.2.9. Levels of Integration

Within the scope of the survey, shipyards were asked indirectly about their level of integration which made it possible to examine the integrated elements and talk about integration levels. Shipyards were also asked whether they implemented full integration. Figure 14 shows the instances of full integration, the results imply that almost half of the surveyed achieved full integration. While 9 of the shipyards stated that they implemented full integration, 8 of them stated that they did not apply full integration. Scrutinising the answers to this question and the elements integrated together allows us to make clearer comments about the levels of integration.

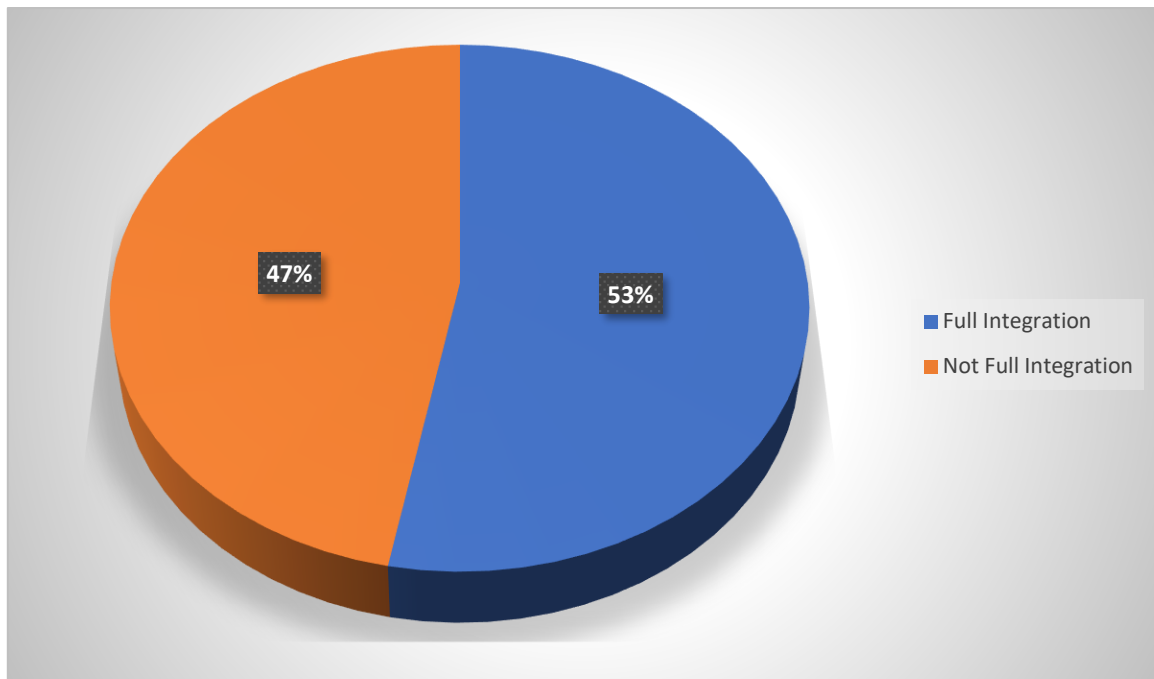


Figure 14: *Existence of full integration*

Most shipyards have integrated procedures, internal audits, internal communications, the management handbook, and regulatory and preventive actions. This may prove that these shipyards are in the level of alignment. Rasmussen (2007) associated the level of alignment with increased internal efficiency. According to the survey, 47% of the respondents stated that the time required for management has decreased and 35% stated that costs have decreased. Considering these results and integrated elements, it can be said that a certain percentage of shipyards are at the level of alignment.

It seems that some shipyards are at the level of integration. Rasmussen (2007) attributes this level to the increase in overall efficiency thanks to the integration, the use of the specified models and the increase of harmony by creating synergy between systems. 53% of the shipyards in the survey stated that the incompatibility between the systems has decreased. In addition, it was determined that 82% of shipyards integrated targets and training, 88%

integrated internal audits and 77% integrated internal communications. These results are evident of increased harmony between systems.

Rasmussen (2007) thought that holistic integration includes continuous improvement, stakeholder participation, Total Quality Management and Six Sigma. According to him, in addition to those provided at the level of alignment and integration, the increase of innovation and company image supports the holistic level. 8 shipyards reported an increase in innovation. This situation supports the result of fully integrated shipyards. However, only 4 shipyards using a TQM-based integration model cannot fully meet this particular result. As a result, 9 shipyards reported implementing full integration, but according to the results, almost half of them actually achieved full integration. This rate is not very low and is expected to increase in the future.

6. Recommendations for Establishing an IMS

This section will explain how an integrated management system should be created for shipyards, based on the information provided earlier in this dissertation.

- The steps in establishing an IMS can be named as follows:
- Determine a policy for the shipyard,
- Determine the strategic planning of the system,
- Implementation and operation,
- The control of the system,
- The evaluation of the system, determination of the processes and establishment of the system

Some flowcharts were prepared to understand this system more easily. Figure 15 shows the steps to follow when setting up the IMS.

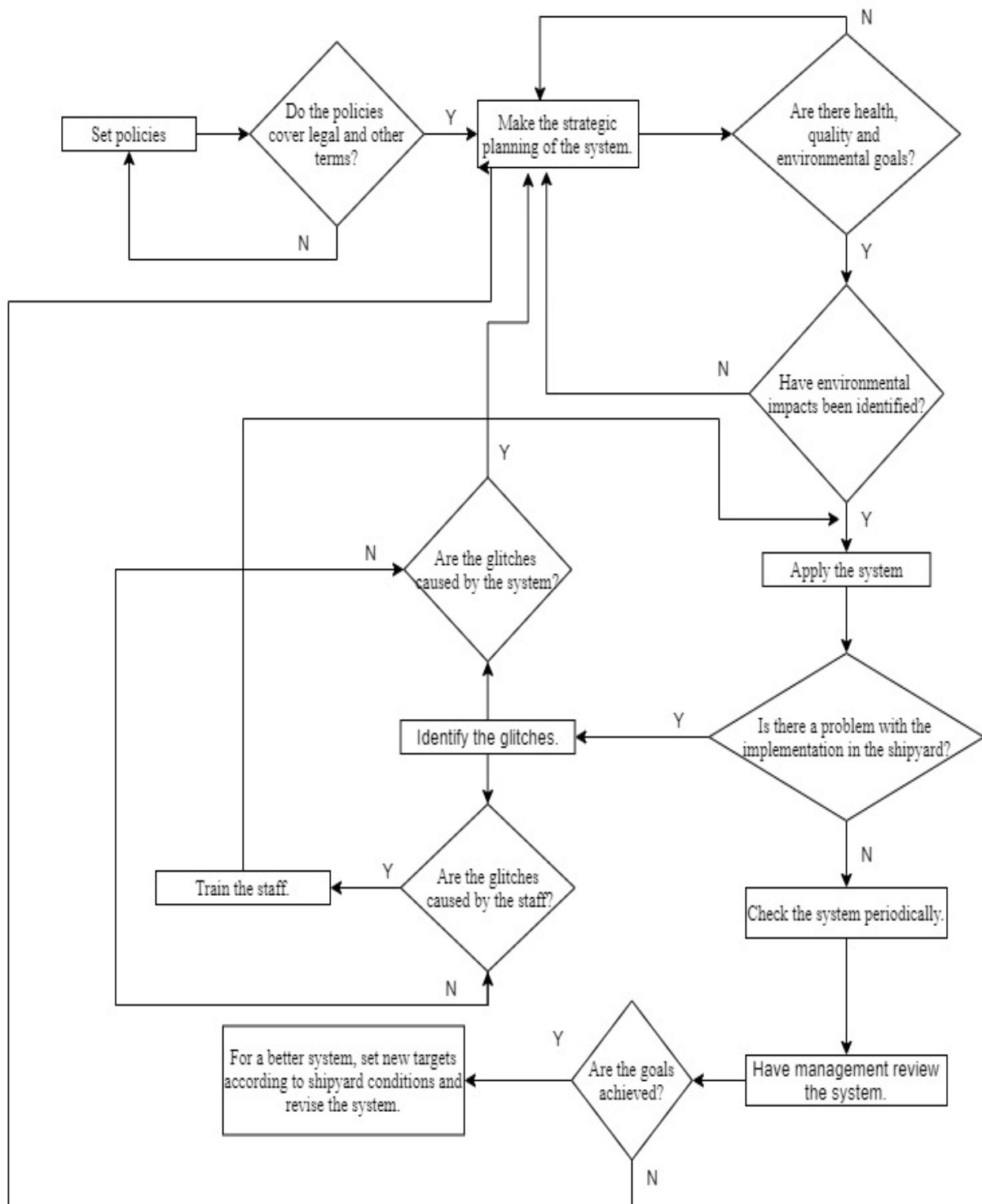


Figure 15: Flowchart of IMS suggestion

6.1. Policy Determination

Shipyards top management should determine safety, environmental, and quality policies in line with the needs of the management systems. The policies created should be understandable and applicable to all employees in the shipyard. For the purpose of integration, these policies should be considered as a single element.

With environmental and security policies, possible risks and loss of life should be prevented and harmful effects to the environment should be reduced. These policies should ensure a safe working environment in the shipyards.

On a basic level, the quality policy is no different from the other two. It should cover the quality of the personnel and processes of the shipyard.

These policies should include the objectives and commitment of top management. While setting policies, goals as well as external and internal factors that may hinder these policies should be considered. Policies must comply with legal and other requirements. Trainings, audits, and continuous improvement should be included in the policy.

6.2. Planning the System

Shipyards should establish a solid infrastructure while planning their system. While planning this infrastructure, six main topics should be considered: environmental impacts, legal and other requirements, safety and environmental targets, quality planning and targets, customer satisfaction, and management programs (Jørgensen et al., 2006).

When planning the IMS, shipyards should determine all steps and processes required for shipbuilding. All processes must meet legal requirements. For example, when cutting or pressing steel sheet, appropriate material should be used, and these operations should be

performed with approved tools. The targets (quality, environment, and safety) determined during the planning of the system are evaluated with the feedback data received from the customers. If the targets are achieved, the system has a practically applicable structure. Thus, communication with the customer is extremely important when planning. This is especially the case if a custom ship is being built, where the customer can be involved in every step from processes to design.

In summary, every stage should be considered while planning the system. Plans should be designed according to the target and all elements of the management system should be included in the planning process. If systems are implemented individually, plans can get riddled with confusion and dissent. The integrated system aims to eliminate this. Figure 16 shows the strategic planning of the IMS in a flowchart.

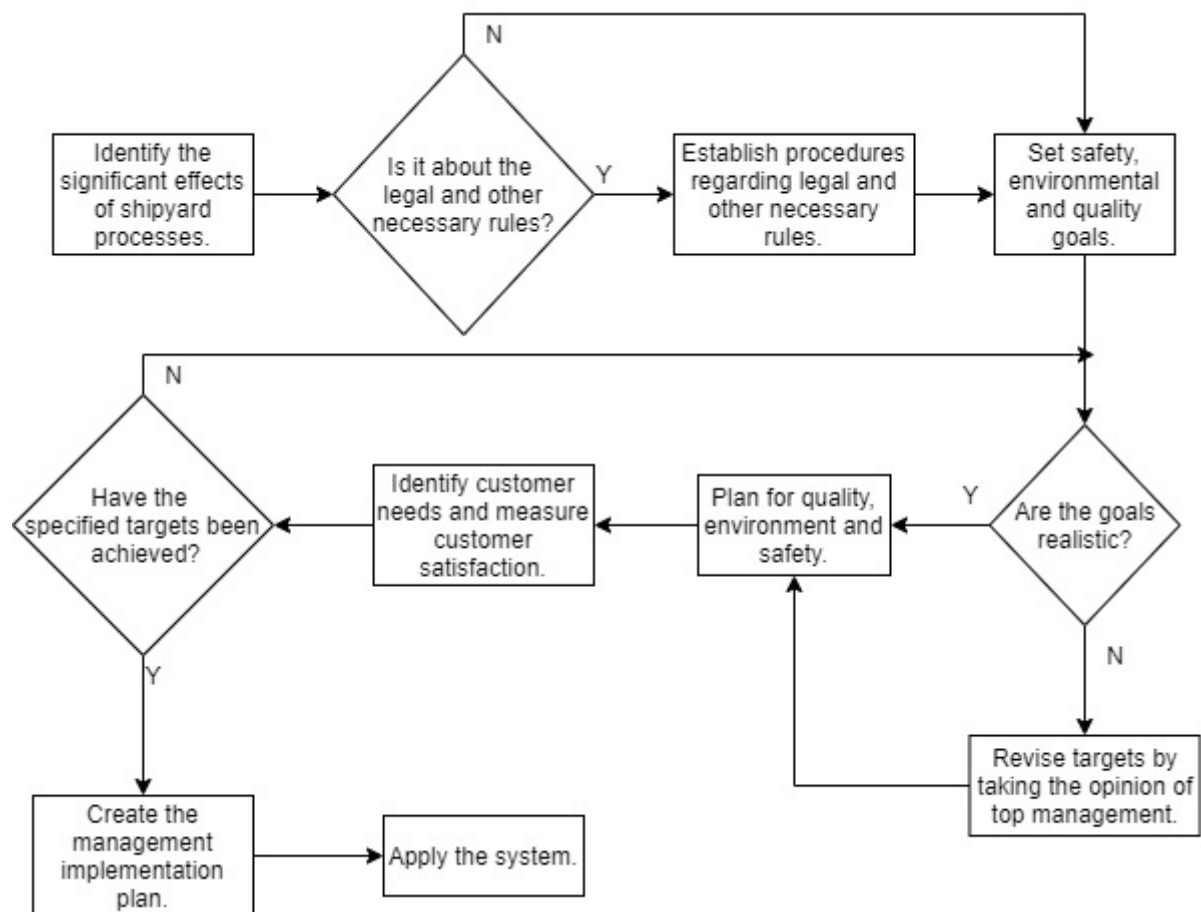


Figure 16: The strategic planning of the IMS in a flowchart

6.2.1. Environmental Impacts

Shipyard managers should determine the environmental impacts of shipbuilding processes while planning and write down in their company policy the order of importance of impacts.

The flowchart in Figure 17 below describes the determination of environmental effects.

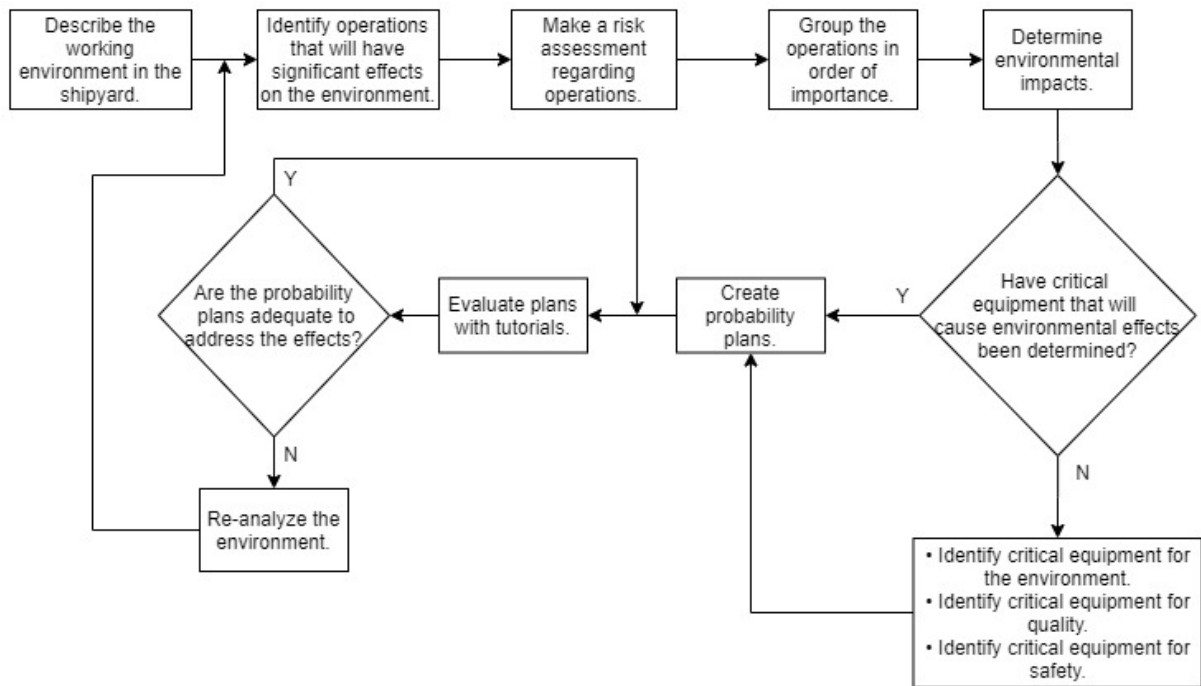


Figure 17: *Determination of environmental impacts*

6.2.2. Legal and Other Requirements

The shipyard must have documents defining the official requirements, laws, regulations, and maritime laws concerning all processes.

6.2.3. Safety and Environmental Goals

During the planning phase, it is important for the top management to determine environmental and safety goals, which should always be consistent with policies. Some factors should be considered while determining the goals. These factors are:

- Compliance with laws and industry rules
- Significant environmental impacts that will occur because of the goals
- Views of relevant parties
- Technological options
- Financial, operational, and business requirements needed for the goals

6.2.4. Quality Planning and Goals

The processes should be planned by the shipyard and developed if necessary. This planning formation can also be called a quality plan. If the resources are prepared and processes are determined for production, it will be useful for planning if additions are made in advance. While planning the quality, the shipyard should pay attention to keeping the records required to demonstrate conformity during the product provision phase.

6.2.5. Customer Satisfaction

Meeting customer expectations is just as important here as in every sector. In line with customer satisfaction, when changes are made to the operation of the system, the personnel related to the change should be aware of the new requirements. It is important to get confirmation from customers that the product is delivered on time and smoothly, to listen to their complaints, and to be in contact with them.

6.3. System Implementation and Operation

Generally, the integrated system has two stages: implementation and operation of the integration. Operating the integration is not as easy as implementing it. There are some necessary elements for the implementation and operation of the integrated system. The integrated elements described in Section 5.2.6. are among these essential elements. Elements required for the implementation and operation of the IMS are:

- Resources
- Management representative responsible for systems
- Staff
- Training and awareness
- Communication

- Documentation control
- Control of operation
- Purchase
- Customer property
- Tracking
- Emergency preparedness
- Audits

While the establishment of the system is related to the top management, the implementation and operation are dependent on the whole shipyard. In general, top management should be informed about the needs of the staff and the personnel. The system should be suitable for everyone, not just a particular group. The personnel should be informed about the IMS and the necessary training should be given to the personnel. Personnel must follow the instructions and adapt to the new system. Everything should be clear and understandable in this system, where communication is fundamental.

6.4. System Control

System control is extremely important in terms of identifying nonconformities, revealing errors, and taking regulatory and preventive actions. There are four main elements in system control:

- Observation and measurement
- Non-conformity, corrective and preventive actions
- Records
- Internal audits

The cycle diagram in Figure 18 shows the components of controlling the system.

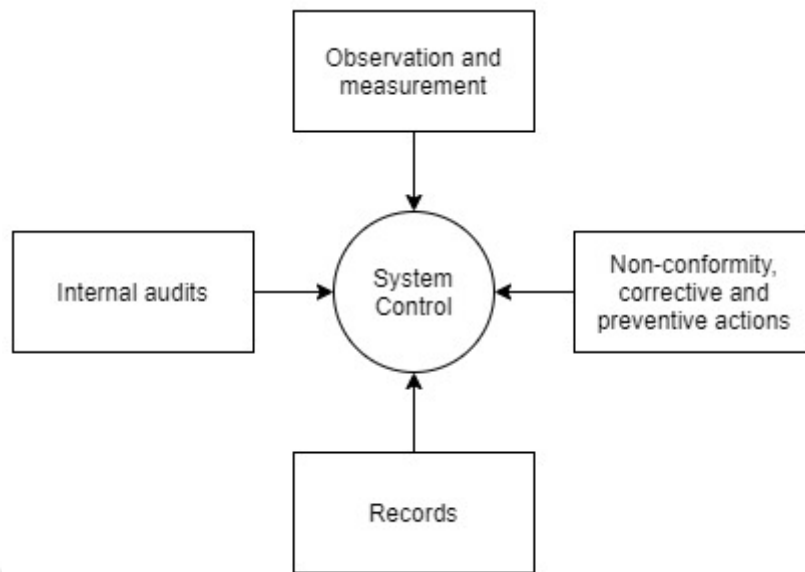


Figure 18: *Components for controlling the system*

These elements can be better explained with an example. Ship plate welding is one of the most important processes for ships. An improperly made welding threatens quality and human safety. Thus, welding is constantly checked with the help of certain tests. Any incorrect or inappropriate situation is recorded, and measures are taken accordingly. These records are kept in the name of the continuous improvement principle. To prevent similar problems from occurring again, quality control engineers also have inspections at regular intervals.

The shipyard must ensure that the quality, environmental, and safety goals are met. In addition, procedures should be checked to ensure that legal requirements regarding environmental and safety are met. Equipment used in production must be constantly checked and calibrated. Not only the products and equipment used, but also the effectiveness of the IMS must be checked.

6.5. Management Review

Management review is one of the important elements that cannot be ignored in the establishment of the IMS. It ensures the system's existence after it is established. Therefore, the procedures for management review should be established by the shipyard.

Reviews should be done frequently. This is beneficial for the development of the company. The management review should consist: evaluation of the suitability of the work done, efficiency, quality, environmental and safety targets, efficiency of the system, internal and external audit reports, customer evaluation reports, determination of the effectiveness of preventive and corrective measures, suggestions for continuous improvement, if any, the continuation of the system and identifying needs for better issues (İnalman, 2006).

Figure 19 below is a detailed flow diagram on how to effectively implement the management review. The management review of the system within the integrated management system implementation differs from the other three systems. Management should remain more flexible than other systems and perform risk assessment well.

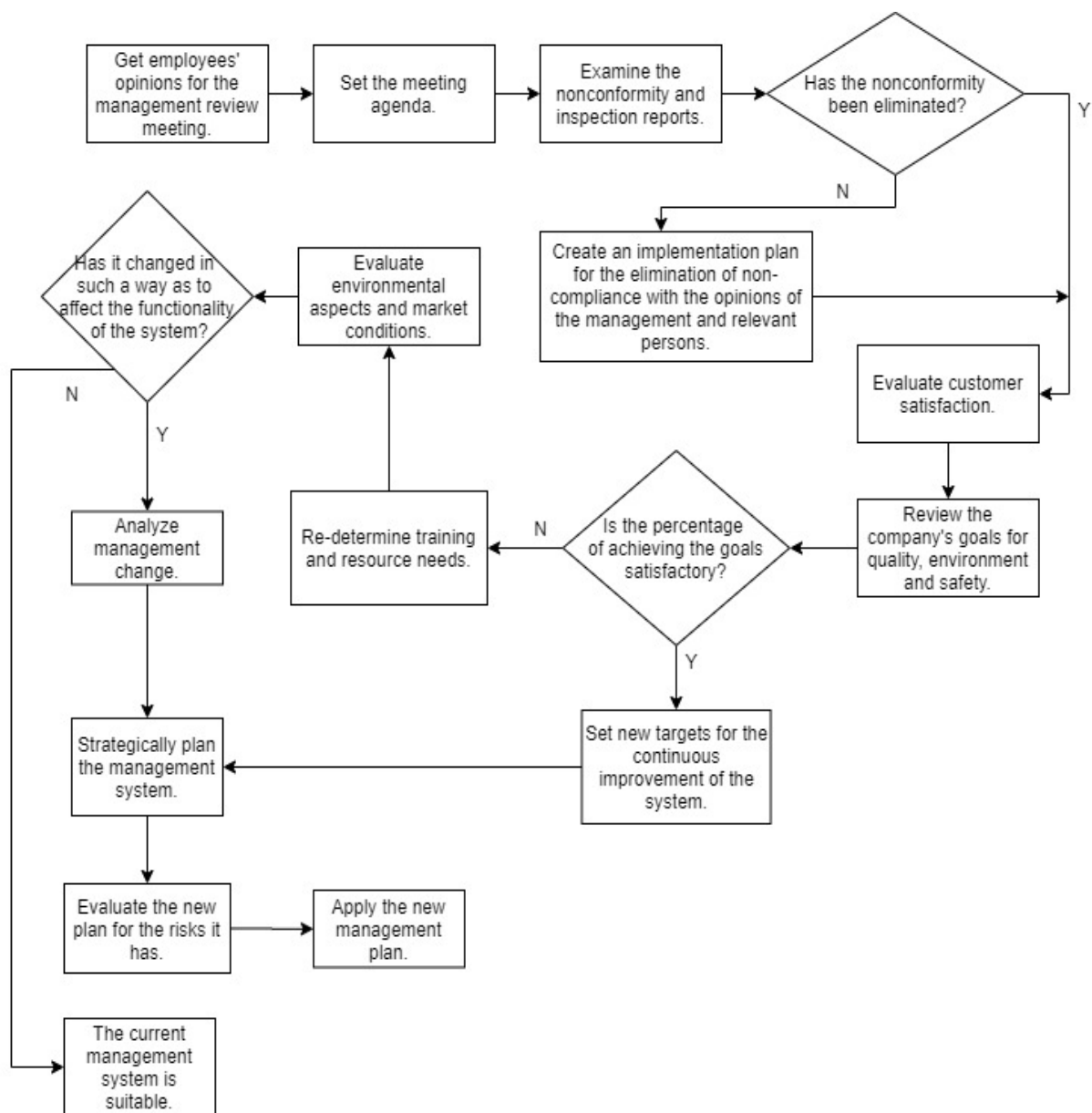


Figure 19: Management's review of the system

7. Conclusion and Discussion

This dissertation, consisting of seven main sections, can be examined in two parts: a review of the general properties of IMS and studies on IMS in shipyards. The first four main sections make up the first part. In the scope of this dissertation, firstly, the concept of integration is emphasized, and the concept of IMS is briefly introduced. This was followed by a literature review of studies on integration. This literature review includes previous studies and articles on IMS, implementation, benefits, models and features of IMS, and challenges to IMS. The following section examines the concepts of quality, environment and OHSMS within the scope of the factors that make up the IMS. Moreover, the section also elaborates on the main features of an integrated system, details of the benefits it provides to companies and of the obstacles encountered during implementation. The fourth section details the five most used models of the integrated system in the world and provides a comparison. The section analyses the features of the models, their base principles, and their contents. The remaining two sections at the end fall in the second part of the dissertation. The fifth chapter is the most important part of the dissertation, containing the survey conducted online in the summer of 2020 with shipyards located in Turkey and its results. The results can be summarized as follows:

- The participation rate in the study is 38.3%.
- 94% of the companies participating in the survey use an IMS.
- A review of the participating shipyards shows that there are small (<100 employees), medium-sized (100-500 employees) and large (500-2500 employees) enterprises. 65% of the shipyards fall in the medium-sized enterprises category.
- 65% of the participants have integrated QMS, EMS and OHSMS.

- The years of integration show that there is a significant increase after 2000. This is in line with the literature.
- All participating shipyards used more than one assistance resource for integration.
- According to the results of the survey, it was determined that the shipyards have integrated various elements. Procedures (88%), internal audits (88%), objectives (82%), and training (82%) make up the top four among the integrated elements.
- It was observed that the shipyards participating in the research have seen benefits of IMS in ways such as increased coordination between different systems, saving time and money, and increasing focus on quality / environment.
- Almost half of the shipyards (53%) stated that they have full integration.
- 76% of the shipyards emphasized that IMS does not cause them any disadvantages. This result is similar to the literature.
- Three of the shipyards participating in the research stated that they did not encounter any difficulties. The most important difficulties encountered were stated as lack of knowledge (65%) and difficulty in organizational change (59%).

Although the participation rate is low, it can be argued that the result is representative of the wider Turkish shipyard population due to their similar backgrounds and purpose of the shipyards located in Turkey.

As a result of the previous research of the researchers, what I have experienced as an employee of the sector, and the research I have conducted, I argue that shipyards with an IMS have more efficient work environments than shipyards that implement the systems separately. By gathering the operating system under a single roof, the document confusion will be eliminated, thus creating a more comfortable operating system for employees. With a

single handbook to be prepared by combining the three standards, all procedures will be located in the same place and the functionality of the employees and the system will increase as their access becomes more practical. Due to the efficient operation in systems that work smoothly, the organisation will benefit from a higher income flow than normal the personnel's contribution to the system will increase, and a peaceful working environment will be present within the company. Furthermore, if the management system functions fully and in accordance with its purpose, damages to third parties will be minimized. A properly implemented IMS will provide the benefits that are examined in this study. Finally, the sixth chapter of the dissertation makes a proposal for the establishment of an IMS in shipyards, where the steps to be followed are listed. These recommendations are briefly mentioned below:

1. Top management should ensure the establishment of an integrated system and provide all kinds of financial and moral support in this direction.
2. Staff should be trained, and system awareness should be created.
3. All staff must be motivated. Providing opportunities may be insufficient in some cases. Motivation should always be a complementary element.
4. Before the system is established, a strategic plan should be made, and measures should be taken. Risks should be defined and analysed before procedures are defined. The system must be able to keep up with changes. Moreover, the duties and responsibilities of each personnel should be determined within the system.
5. The system should be audited and checked periodically. Audit procedures should be comprehensive.
6. Apart from the audits, the system should also be evaluated by top management.

The results have answered the research questions mentioned in Section 2. Section 6 explains how to follow the IMS for shipyards. Section 3 expresses, the components that make up the integration, the benefits and difficulties of integration, and Section 5 explains the benefits of integration for shipyards and the difficulties encountered by taking into account the survey results. The most important integration approaches and models are discussed in detail in Section 4.

However, the study results also show that there are issues to be discussed and questions to be asked. Looking at the literature review, we see that there are almost no studies on shipyards. Yet, there are studies regarding the benefits and implementation of IMS for many business areas and many sectors. In this case, we can ask the following question:

- Why is there so little research specific to shipyards when there is plenty of research on IMS for many businesses and business areas?

In addition to this question, we can ask the following two questions as a result of the literature review:

- Why not have an IMS standard in Turkey?
- How should shipyards be encouraged to establish an IMS?

This study aimed to bridge the gap in the field to some extent. With the research questions, we learned the benefits and shortcomings of IMS in shipyards as well as how to apply IMS for shipyards. In addition, at the end of the study, a new study area was created with the questions above. Within the scope of this dissertation, the question of IMS implementation in shipyards has been answered. However, the other questions above may constitute the main topic of another study.

Another issue that needs to be discussed is the reduction of focus on some points with the integrated system according to the survey results. Some shipyards reduce their focus on quality, some on the environment, and some on OHS regulations. It is possible to evaluate this situation from two angles. The first angle is that shipyards may have been too focused and interested in a single factor. In this case, with the implementation of the IMS, order will be established, and excessive focus will disappear. At first glance, this may seem like a disadvantage, but in such cases, it saves cost and time and shipyards are freed from unnecessary focus. The second angle is that this may have created a real disadvantage. Due to the incomplete understanding and incorrect installation of the integrated system, some factors may not have gotten adequate focus. In this case, one factor stands out while the other remains incomplete, and the integrated system cannot achieve its full purpose.

I can say that there is a clear desire for integration in Turkish shipyards, but there is also a confusion. The lack of a clear standard for IMS creates shortcomings and some difficulties. In the years to come, establishing a strong IMS standard like Denmark (DS 8001) will have much more successful results for both shipyards and other businesses.

As an engineer who has worked in a shipyard before, I can say that shipyards greatly need an IMS. However, many shipyards do not show the necessary interest in full integration because of their focus on short-term gains. Full integration is a long process and should span over years. Shipyards who are looking to make profits and increase company prestige in the long-term have already begun to embrace full integration. Shipyards in Turkey in the coming years will begin to adopt this perspective much more widely because the full integration allows gains in the long-term, provide and facilitate the company's growth, and attracts customers.

In conclusion, the results obtained within the scope of this research show that IMS implementations provide significant benefits to shipyards. It is anticipated that more shipyards will start IMS applications in the future.



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Appendix 1: *Compatibility matrix for management systems*(Source: Rebelo et al., 2014)

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Appendix 2: Question Form Used in the Research

1) What is the establishment date of your company?

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2) What is your position in the company?

.....

3) How many people are working in your company?

.....

4) What certificates does your company have?

- a) ISO 9001
- b) ISO14001
- c) ISO 45001
- d) OHSAS 18001
- e) ISO 22000
- f) Other:

5) Which certificate has your company had for how many years?

.....

6) Is there any integrated management system implementation in your company?

- a) Yes
- b) No

7) Which of the following systems includes the integrated management system in your company?

- a) ISO 9001
- b) ISO 14001
- c) ISO 45001
- d) OHSAS 18001
- e) ISO 22000
- f) Other:

8) What year was the integrated management system started to use in your company?

.....

9) Which assistance elements did you use while implementing an integrated management system in your company?

- a) Guidelines used by other IMS practitioners
- b) Consulting companies
- c) Experiences of other IMS practitioners
- d) Certification bodies
- e) Lloyds
- f) No help received

10) What is your integrated management system implementation strategy?

- a) Integration in one go at the beginning
- b) First implementation of the systems separately and following this, transition to the IMS application

11) Which model is your implementation of integrated management system based on?

- a) PDCA cycle based on ISO 14001
- b) Process approach based on ISO 9001
- c) Process approach with PDCA cycle (System Approach)
- d) Total Quality Management
- e) Integration is not based on a specific model
- f) Other:

12) Which elements did you integrate within the scope of the integrated management system implementation?

- a) Management handbook
- b) Policy
- c) Procedures
- d) Targets
- e) Distribution of resources
- f) Decision making process
- g) Regulatory and preventive activities
- h) Training
- i) Internal audits
- j) External audits
- k) Managing documents
- l) Internal communication
- m) Management review
- n) External communication
- o) Organization (Attitudes of employees or work environment towards the integrated management system)
- p) None
- q) Other:

13) Is there full integration in your company?

- a) Yes
- b) No

14) What are the benefits of the integrated management system implementation for your company?

- a) Costs related to management of systems decreased
- b) Time required for management reduced
- c) Time spent on internal audits reduced
- d) Time spent on external audits reduced
- e) Documentation made simple
- f) Documentation coverage narrowed
- g) Better coordination achieved
- h) Incompatibilities between different management systems have decreased
- i) More focused on quality
- j) More focused on the environment
- k) More focused on occupational health and safety
- l) Innovation has increased
- m) No benefit provided
- n) Other:

15) What kind of disadvantages did the integrated management system implementation bring to your company?

- a) Caused less focus on quality
- b) Caused less focus on the environment
- c) Caused less focus on OHS
- d) Documentation has become more complex
- e) Management has become more complex
- f) Did not bring any disadvantages
- g) Other:

16) What obstacles did you encounter while starting the implementation of the integrated management system?

- a) Lack of resources
- b) Lack of information
- c) Insufficient motivation
- d) Difficulty focusing on different areas
- e) Difficulty in achieving organizational change
- f) We did not have any difficulties
- g) Other:

17) Do you want to be certified according to an integrated management system standard?

- a) Yes
- b) No

If you have additional explanations about integrated management systems, you can write below.

.....

.....

Thanks for your answers!