OPTIMISM

SAFETY@SEA

Summary of OPTIMISM Training Programme

Text Book for Senior Shipping Executives and Training Professionals

Authors and Affiliations

Professor Dr Reza Ziarati[1]
[1] Centre for Factories of the Future (C4FF), Alingsås, Sweden
Email: reza.ziarati@c4ff.se

Professor Dr German de Melo[2]*
[2] Faculty of Nautical Studies of Barcelona, Polytechnic University of Catalonia, Pla de Palau 18, 08003 Barcelona, Spain
Email: german.de.melo@upc.edu

Captain Heikki Koivisto[3]
[3] Crescat Oy, Finland
Email: heikki@crescatoy.net

Captain Nuri Cayacan[4]

Professor and Captain Janusz Uriasz[5]
[5] Institute of Maritime Technology, Faculty of Navigation, Maritime University of Szczecin, Wały Chrobrego 1–2, 70-500 Szczecin, Poland
Email: j.uriasz@pm.szczecin.pl

Professor Lakhvir Singh[6]
[6] Center for Factories of the Future (C4FF), UK
Email: lakhvir.singh@c4ff.co.uk

Amirehsan Barzegarsedigh[7]
[7] Center for Factories of the Future (C4FF), UK
Email: amir.sed@c4ff.co.uk

Vanessa Makar[8]
[8] Center for Factories of the Future (C4FF), Alingsås, Sweden
Email: vanessa@c4ff.se

Aris Chronopoulos[9]
[9] IDEC S.A., 96 Iroon Polytechniou Avenue, 18536 Piraeus, Greece
Email: aris@idec.gr

Dr Juan A. Moreno[10]
[10] Faculty of Nautical Studies of Barcelona, Polytechnic University of Catalonia, Pla de Palau 18, 08003 Barcelona, Spain

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Foreword

Maritime safety is built on hard lessons. Many of the rules, procedures, and systems used today exist because something went wrong in the past. Yet despite clear regulations, modern technology, and extensive training requirements, serious accidents continue to occur at sea. In many cases, the causes are familiar. Procedures were bypassed, risks were underestimated, communication failed, or commercial pressure took priority over safety.

The OPTIMISM programme was developed in response to this reality. Its purpose is not to repeat what seafarers already know, but to address the gap between written procedures and real behaviour on board. Safety management systems are only effective when they are understood, applied, and supported by a strong safety culture. This book is designed to help turn safety from a document into a daily practice.

Chapters 1 to 6 follow a clear and logical structure. The book begins with the foundations of the ISM Code and the responsibilities it places on companies and individuals. It then examines what can be learned from accidents, inspections, and audits, using real data to highlight recurring weaknesses in maritime operations. Risk assessment is presented as a practical decision-making tool rather than a paperwork exercise, with a strong focus on the human element and operational realities.

The later chapters move from analysis to application. The use of structured assessment frameworks and immersive virtual reality training allows safety lessons to be experienced rather than simply described. By placing learners in realistic scenarios, the programme encourages correct decision-making, procedural discipline, and hazard awareness under conditions that closely reflect real life at sea. Mistakes can be made, understood, and corrected without real-world consequences.

This book is intended for seafarers, ship managers, trainers, auditors, and regulators who understand that safety cannot rely on compliance alone. Real safety depends on competence, leadership, and the willingness to learn from past failures. By combining regulatory knowledge, practical analysis, and modern training methods, the OPTIMISM programme offers a grounded and practical contribution to improving safety at sea.

It is hoped that this work will support individuals and organisations in strengthening their safety practices and, ultimately, in preventing accidents that are too often repeated and too often avoidable.

Professor Dr Reza Ziarati BSc (Eng), PhD (Eng), Cert Ed, CMechE, CElecE, CMarEng, CEng, FIMechE, FIET, FIMarEST

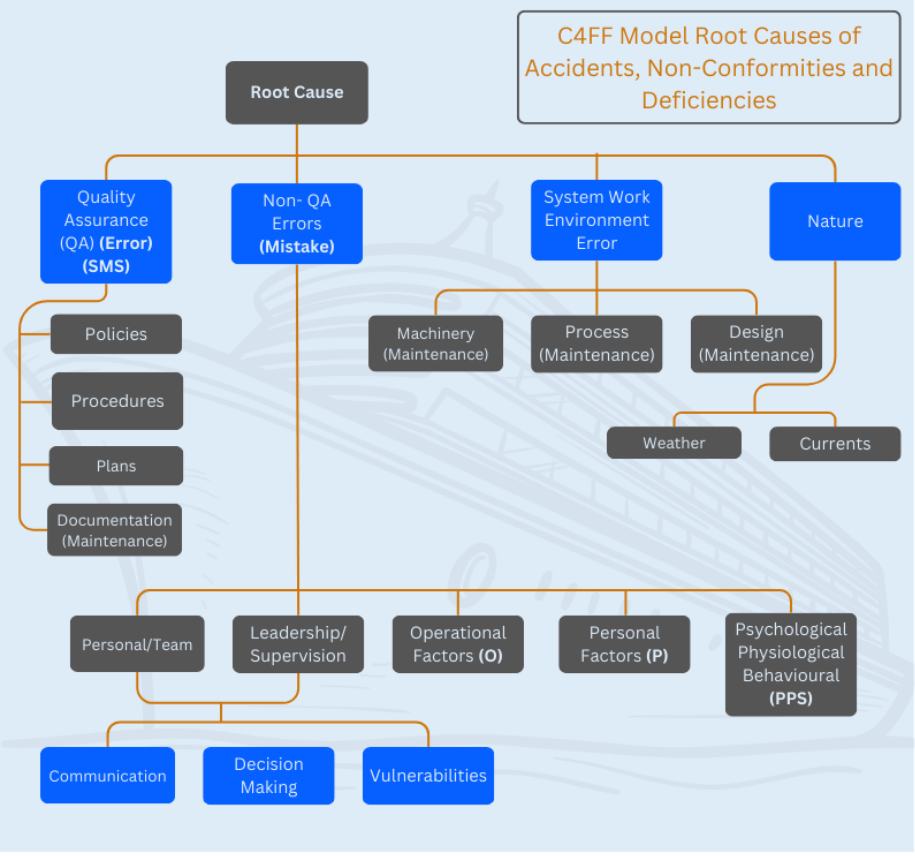
Centre for Factories of the Future - Sweden

Summary for Senior Ship Operation Managers

The Maritime Safety section of the OPTIMISM training programme provides a structured, competence-based progression from regulatory foundations to advanced, immersive safety training. Chapters 1 to 6 are designed to build a deep, practical understanding of how maritime safety is governed, how failures occur, how risks are managed, and how lessons from real incidents are transformed into behavioural competence.

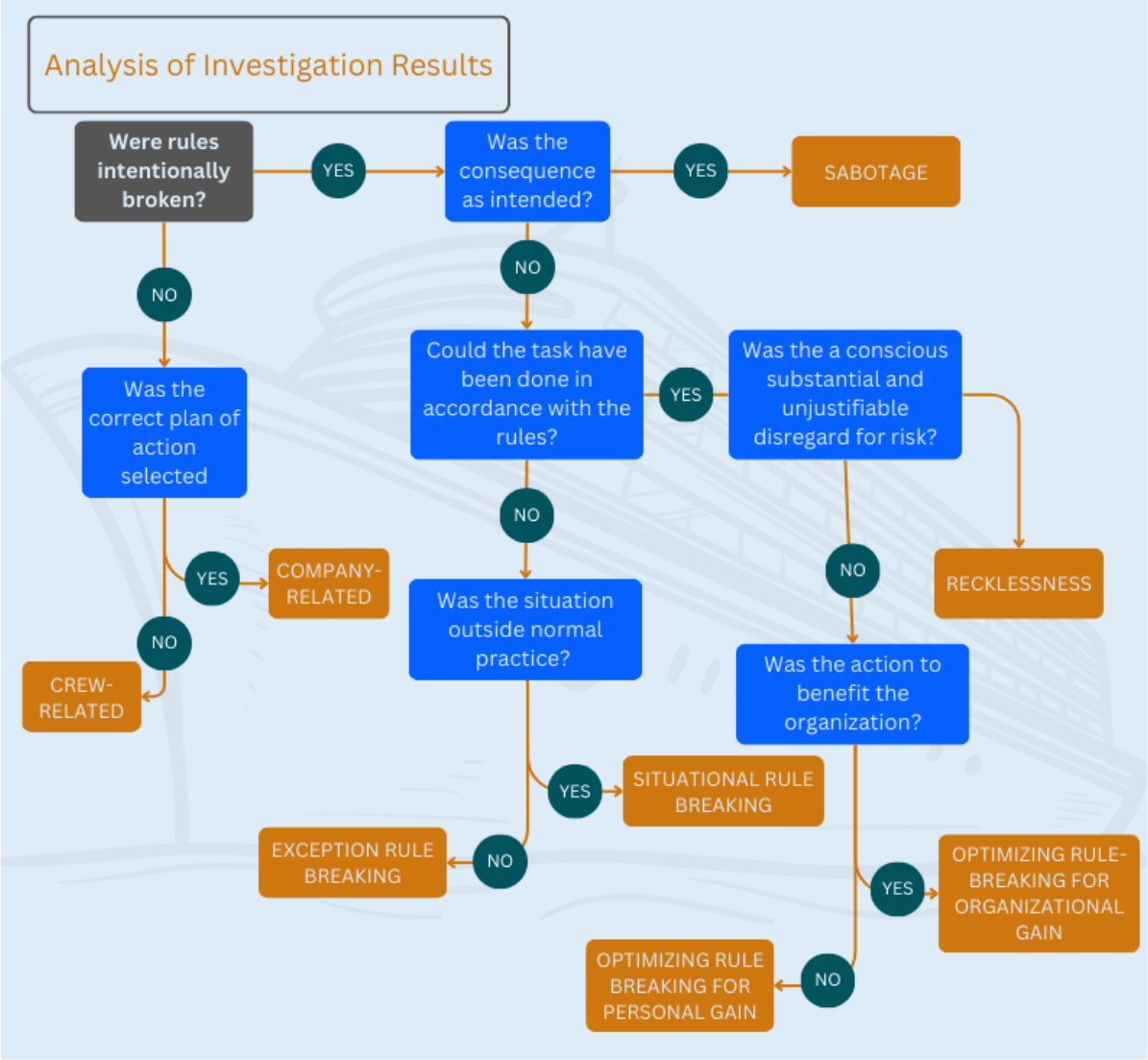
Chapter 1 introduces the International Safety Management (ISM) Code and its role in ensuring the safe operation of ships and the protection of the marine environment. It establishes the regulatory context by explaining how international conventions, company policies, audits, and certification processes combine to form an effective Safety Management System (SMS). This chapter ensures learners understand compliance requirements, management responsibilities, and the importance of monitoring and continuous improvement.

Chapter 2 focuses on learning from accidents by analysing real maritime incidents and investigation reports. Using validated accident analysis frameworks, this chapter identifies recurring root causes such as procedural non-compliance, inadequate supervision, poor risk assessment, human error, and weak safety culture. Learners develop the ability to assess whether incidents are ISM-related and to translate accident findings into preventive actions that strengthen the SMS.



Root causes of accidents, incidents, non-conformities (audits) and deficiencies (port inspections)

Source: Ziarti et al. (2026)

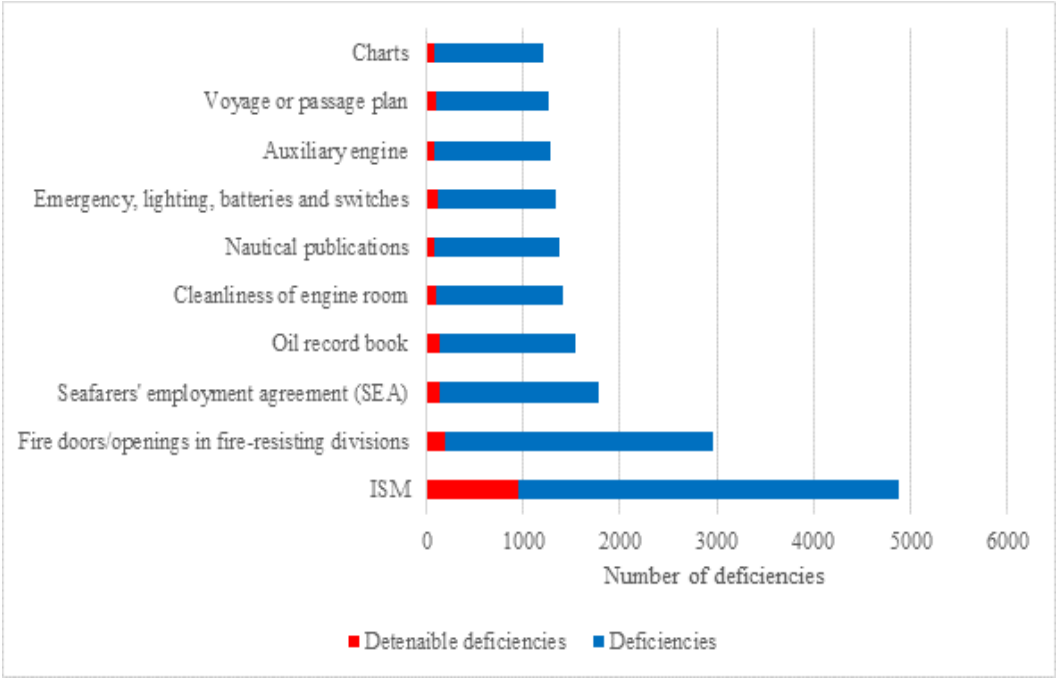


Analysing investigations methodology: Crew related mistakes vs. Company related errors (Source: Ziarati et al. 2026)

Chapter 3 builds on this by examining inspections and audits as proactive safety tools. It analyses Port State Control data, audit non-conformities, and key performance indicators to reveal systemic weaknesses in maintenance, navigation, training, and organisational oversight. Learners gain the competence to interpret audit findings, distinguish between isolated errors and systemic failures, and use inspection results to drive continuous improvement.

Pareto Analysis of ISM Non-conformities: Accident reviews vs ISM Code Audits			
Non Conformities Observed/Noted	ISM Code Pareto Ranking	Accident Analyses/Reviews Pareto Ranking	Notes
1.2.2.1 - Safe Working Practices	16		The Pareto analysis of findings from accidents show that ISM requirements for compliance with the 'rules and regulations', 'management and decision making' and 'establishing procedures to maintain the ship and identification of measures for systems and machinery' ranked respectively 1. 2 and 3 that if resolved expected to make the most impact in effectiveness and the effective implementation of the ISM Code. Ranked 4, 5 and 6 were 'shipboard Operations', 'safeguard against identified risks' and 'Ineffective communication/language issues'. 'Emergency planning' ranked 7 and 'Crew familiarization on board' ranked 8. Human Vulnerabilities ranked 9 and 'lack of knowledge' ranked 10. Dividing the root causes of accident into ErrorCompany related/ISM Non-comformity and Mistake (Crew related/management fault and machine failure/System Error did help in classifying areas of concern and the intended opportunities for making targeted improvements. Our limited review of accidents tallied well with ISM Audits by IACS/LR on like for like basis.
1.2.2.2 - Safeguards against identified risks	5	5	
1.2.3.1 - Compliance with rules & regulations	1	1	
1.2.3.2 - Taking into account of codes, guidelines & standards	18		
10.1 - Establish procedures to maintain the ship plus 10.3 - Identification & Measures for critical equipment plus 10.4 - Inspection routines & follow up incorporated in the maintenance routines	3	3	
10.2.1 - Inspections held at the proper interval Plus 12.1 - Internal audits at 12 month intervals Plus 12.3 - Management review Plus 12.4 - Audits and corrective actions in accordance with procedures Plus 12.7 - Timely corrective action on findings noted Plus 5.1.5 - Master periodically reviewing the SMS	2	2	
10.2.2 - Deficiencies reported	13		
10.2.3 - Appropriate action on deficiencies taken	11		
10.2.4 - records of activities maintained	15		
11.1 - Establishing document & data control	10		
11.2.1 - Valid documents available on relevant locations	8		
6.2.1 - Ship manned with qualified and medically fit persons Plus 6.2.2 - Ship appropriately manned to safely cover all operations	12		
6.3 - Crews familiarisation on board	14		
6.4 - Adequate knowledge of rules and regulations	20		
6.5 - Identification of training needs	17	7	
7 - Shipboard Operations	4	4	
8.2 - Drills & exercise planning for emergencies	7		
8.3 - Companys ability to respond to emergencies	19	6	
9.1 - Reporting, investigating, analysing accidents, NCs, etc.	6		
9.2 - Implementation of corrective actions	9		
Grand Total			

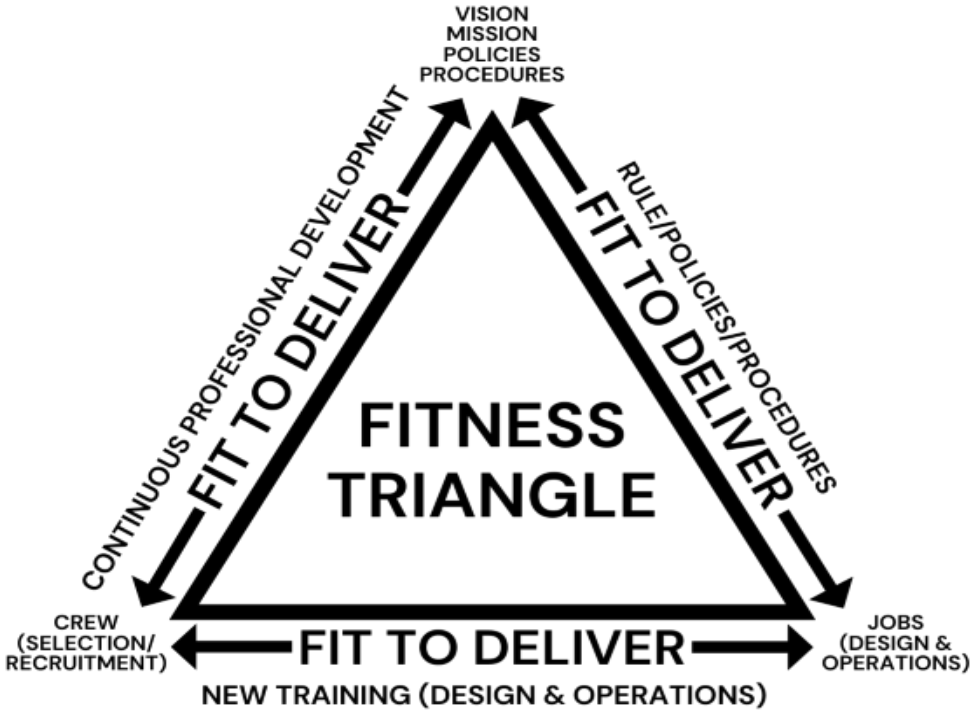
Review of Audit non-conformities applying Pareto Analysis (Source: Ziarati et al 2025)



The ten most frequent deficiencies detected on ships during by Paris MoU 2019-2021

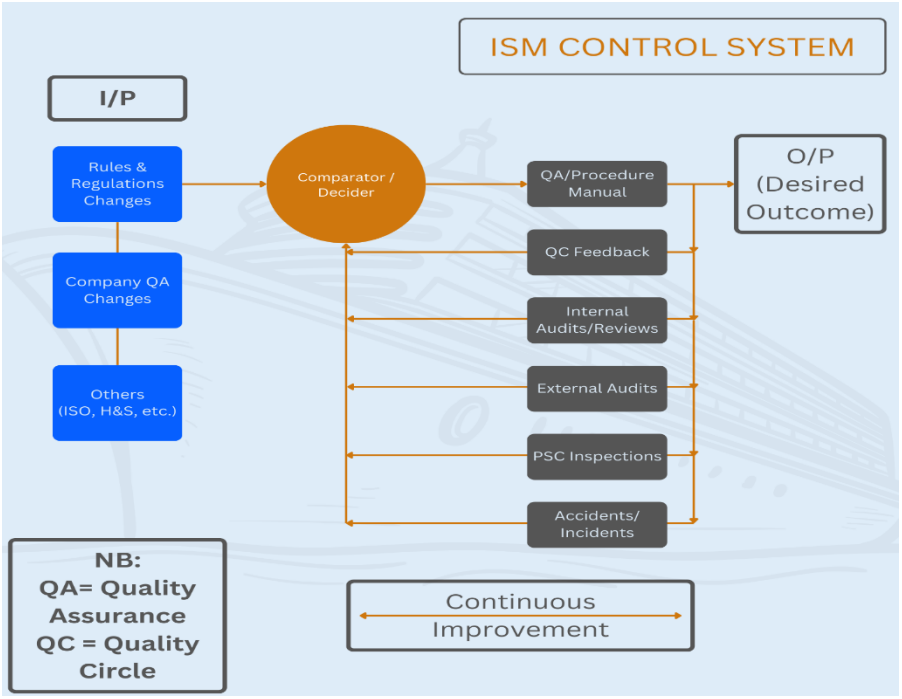
Chapter 4 introduces a comprehensive risk-based approach to maritime safety. It covers hazard identification, multi-level risk assessments, critical equipment management, emergency preparedness, and human element considerations. The chapter integrates concepts such as just culture, leadership, communication, and knowledge management, demonstrating how risk controls must be embedded into daily operations and the SMS to be effective in practice.

Fitness for Purpose vs. Compliance and Known Risk vs. Unknown Risk (Source: Ziarati et al 2026)



Fitness Triangle: Fitness for Purpose vs Compliance (Source: Ziarati et al 2025)

Chapter 5 applies these principles through a structured Safety Assessment Gap Analysis (SAGA) which is bases on TMSA Gap Analysis. It guides learners through the full SAGA framework, covering management commitment, personnel competence, vessel reliability, navigation, cargo operations, security, environmental protection, management of change, incident investigation, and audit systems. This chapter equips learners with the ability to benchmark organisational performance, identify gaps, and develop targeted improvement actions across all operational areas.



Key elements of Quality Assurance and Control focusing on continuous improvement and feedback (Source: Ziarati et al 2025)

Chapter 6 translates the analytical and procedural learning into immersive virtual reality (VR) training. Real accident data is converted into high-fidelity VR scenarios covering enclosed space entry, gas detection, PPE use, firefighting, and emergency response. Through experiential learning and performance feedback, learners develop procedural discipline, hazard awareness, and decision-making skills under pressure. The VR application reinforces safety culture by eliminating shortcuts and enabling data-driven assessment of competence.

Applying Virtual Reality in making entry into confined spaces safer (Source: Ziarati et al 2025)

Together, Chapters 1 to 6 form an integrated maritime safety framework that moves from regulation and analysis to risk management and applied competence. The programme ensures that safety is not treated as a theoretical requirement, but as a lived, practiced capability embedded within individual behaviour and organisational systems.

Extended Summary for Training Professionals

The OPTIMISM Programme brings together six major components of maritime safety and turns them into a unified training framework that strengthens both knowledge and practical competence. The programme recognises that safety depends not only on regulations but on the decisions, people make every day on board. For this reason, it combines regulatory understanding, accident learning, audit insights, risk awareness, industry best practice and immersive training into a single structured course.

The key message across the six chapters is clear. The maritime industry possesses detailed safety legislation, yet preventable accidents continue to occur. Many incidents share common factors such as inadequate risk assessment, weak communication, gaps in supervision and a tendency to rely on routine rather than careful planning. These patterns show that compliance alone does not guarantee safe operations. Safety improves when people understand why procedures matter and when they practise applying them in realistic situations.

The programme begins by establishing a strong grounding in the ISM Code. This ensures that learners understand the purpose of safety management, the responsibilities of ship and shore personnel and the structure of an effective Safety Management System. The next chapters examine real accidents and audit findings, demonstrating how similar causes appear repeatedly across the industry. These insights make clear where understanding is weak and where training must improve.

The programme also emphasises the importance of a risk-based mindset. Although risk assessment is a fundamental requirement of the ISM Code, many accidents occur because hazards were not recognised or because precautions were not taken seriously. A strong risk culture requires consistent communication, thoughtful planning and a willingness to challenge unsafe conditions.

The SAGA framework, explored later in the course, offers a higher standard of excellence that goes beyond compliance. It encourages companies to develop leadership, improve competency management and build systems that continuously learn from experience.

Finally, the programme uses virtual reality scenarios to turn accident lessons into immersive learning. Trainees practise decision making in safe but realistic environments, allowing them to build confidence and develop the behaviours that prevent incidents.

Introduction to ISM Code

Chapter 1 introduces the International Safety Management Code and explains why it is central to modern maritime operations. The Code was created in response to a series of serious maritime accidents that revealed weaknesses in company organisation, training, communication and oversight. It provides a structured framework that helps companies plan their operations responsibly, manage risks and ensure that vessels are operated in a safe and environmentally sound manner.

The ISM Code requires each company to establish a Safety Management System. This system must include a clear safety and environmental protection policy, defined responsibilities for ship and shore staff, documented procedures for key operations and mechanisms for reporting incidents and near misses. At its core, the SMS aims to create a consistent and predictable approach to safety. When used properly, it guides decision making, supports teamwork and helps crews respond effectively to both routine and unexpected situations.

A significant part of the chapter highlights the Master's role. The Code formally grants the Master overriding authority to make decisions that protect the vessel, crew and environment, especially in situations involving risk. This provision corrects past instances where commercial pressure influenced decisions. The Master's authority is reinforced by the company's responsibility to provide adequate resources, training and support.

Certification and verification are also central to the ISM framework. Companies receive a Document of Compliance while vessels receive a Safety Management Certificate. These certificates confirm that the SMS is both documented and implemented. External audits are carried out at regular intervals to ensure that procedures are understood and followed. This process encourages continuous improvement and allows companies to identify weaknesses before they lead to incidents.

The chapter concludes by presenting the ISM Code as a living framework. It evolves as the industry changes and requires companies to adapt their systems over time. For learners in the OPTIMISM Programme, this chapter establishes the foundation needed to understand the importance of accident learning, audits, risk assessment and advanced training methods.

Learning from Accidents

Chapter 2 focuses on what accidents reveal about how work is actually carried out on board ships. Accident investigations consistently show that most incidents are not caused by unusual hazards. Instead, they arise from familiar situations where people misjudge risks, skip steps or fail to communicate effectively. By studying these cases, the programme helps learners understand how safety breaks down and how similar events can be prevented.

A recurring theme in accident analysis is the influence of routine. Many incidents occur during tasks that feel simple or familiar. Over time, crews may become overly confident and begin to remove small safety steps, believing that nothing will go wrong. This gradual erosion of safety margins often goes unnoticed until a serious accident occurs. Investigations also reveal that

communication failures, unclear supervision and fatigue frequently contribute to unsafe decisions.

The chapter highlights several high-risk categories. Enclosed space accidents remain a leading cause of fatalities, often because atmospheres are not tested properly or because rescuers enter without protection. Machinery incidents frequently involve inadequate isolation or misunderstanding of equipment behaviour. Cargo handling and mooring accidents usually result from poor coordination or misjudgement of forces. These recurring patterns demonstrate where operational awareness must improve.

Another insight from the chapter is the gap between written procedures and real practices. Many companies have comprehensive SMS documents, yet crews may not follow them consistently. Sometimes procedures do not reflect real working conditions. In other cases, crews feel pressured to work quickly or prioritise operational demands. Accident reports often highlight situations where procedures were available but not applied or where training did not translate into practical competence.

For the OPTIMISM Programme, the value of accident analysis is twofold. It helps identify the behaviours and decisions that contribute to incidents, and it informs the design of learning activities, including VR scenarios. By understanding how accidents happen, trainees can learn to recognise early warning signs, apply correct procedures and make safer choices in challenging situations.

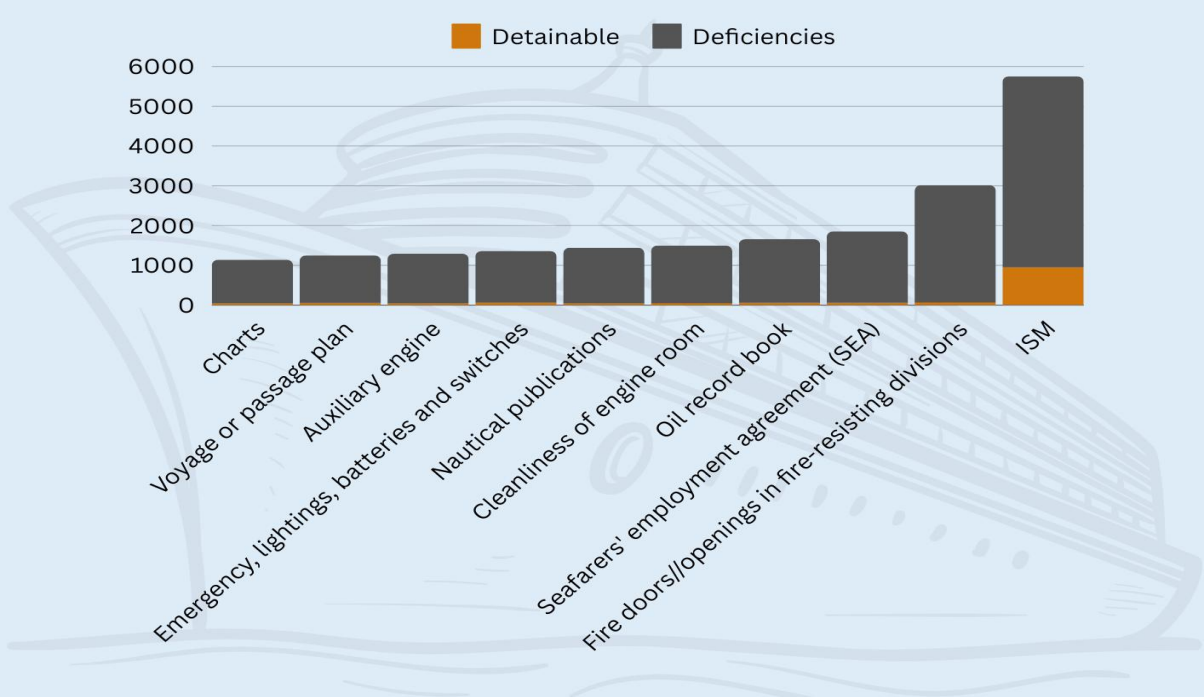
Learning from Inspections and Audits

Chapter 3 examines the findings of Port State Control inspections and ISM audits, which provide a real time view of safety performance across the industry. These findings show how well companies are meeting the requirements of their Safety Management Systems and where weaknesses continue to appear. The results are both valuable and concerning. They show that many of the same deficiencies occur repeatedly, indicating that underlying problems remain unresolved.

Port State Control statistics highlight the scale of the issue. Between 2019 and 2021, roughly eleven percent of all deficiencies recorded by the Paris MoU were related to the ISM Code. More recent data from 2024 shows that detention rates remain significant and that ISM deficiencies continue to be one of the most frequently observed categories. These deficiencies often involve documentation errors, unclear procedures, poor maintenance records or lack of emergency preparedness.

Review of Port Inspections - 2019 – 2021 – Paris MoU

Year	2019	2020	2021
Number of inspections	17,916	13,168	15,387
Number of individual ships inspected	15,447	12,092	13,797
Number of deficiencies	39,821	28,372	36,113
Number of detainable deficiencies	3,015	2,182	3,274
Detentions in % of the total number of inspections	2.98	2.92	3.43
Number of refusals of access to ports	25	8	11



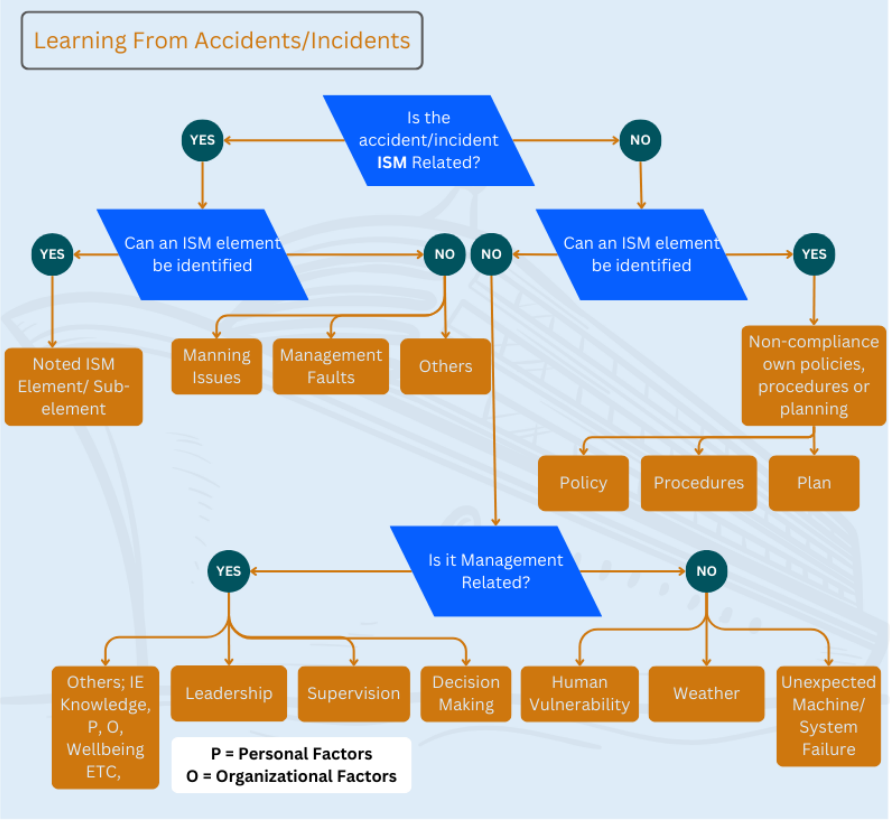
Port Inspection highest frequency deficiencies (Source: Ziarati et al 2025)

ISM audits reveal similar patterns. A small number of clauses consistently account for the majority of non-conformities. These include failures to comply with rules and regulations, weaknesses in maintenance systems, incomplete internal audits and insufficient reporting or investigation of non-conformities. These findings suggest that many companies still struggle to implement the SMS in a practical and consistent manner.

Importantly, the chapter highlights the strong correlation between audit findings and accident causes. The same weaknesses that appear in audits often contribute directly to incidents. This confirms that inspections and audits are valuable tools for identifying operational risks before they lead to harm.

This Chapter also explores the reasons behind persistent deficiencies. Some companies rely on generic SMS documents that do not reflect their actual operations. Others focus on passing audits rather than improving performance. When procedures do not match the reality of work on board, crews must choose between following the document or adapting to circumstances, which creates inconsistency and risk.

Overall, the chapter emphasises that inspections and audits are not merely compliance checks. They are essential mechanisms for learning, improving and identifying the deeper organisational issues that influence safety.



Identifying ISM Code related accidents due to non-compliance (Source: Ziarati et al 2025)

Systemic Issues and the Limits of Procedural Compliance

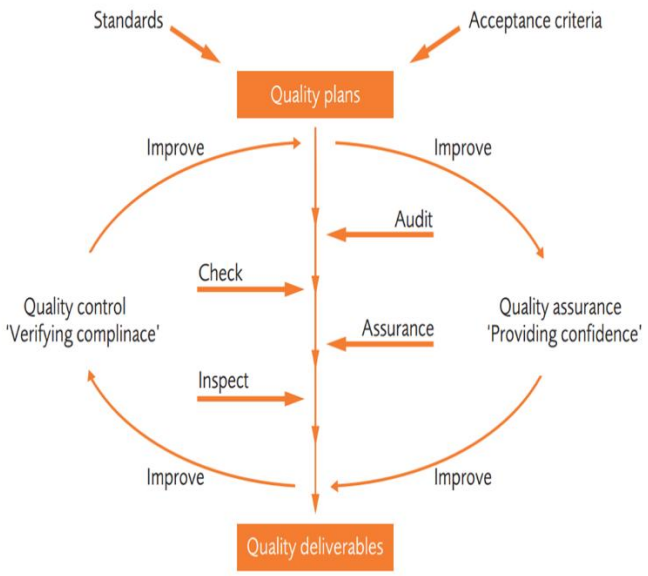
The final part of Chapter 3 looks beyond the findings of inspections and audits to understand the deeper reasons behind recurring deficiencies. Although many vessels carry detailed procedures, the presence of documentation does not guarantee that safe practices are consistently followed. The chapter explains why genuine safety improvement requires more than procedures. It depends on culture, leadership and the willingness of people to apply the system in a meaningful way.

One major issue is the phenomenon of paper compliance. In this situation, documents exist and checklists are completed, yet they do not influence day to day behaviour. This can happen when crews feel pressured by operational demands or when procedures are seen as obstacles rather than helpful tools. Paper compliance creates a false sense of security and often leads to repeated deficiencies in audits.

Another key insight is the mismatch between SMS documents and actual operations. Some companies adopt SMS templates or replicate procedures from other organisations without adjusting them to the ships of their fleet. Each ship must have its own SMS with its own procedures and adapt to their crew capability or trading patterns. As a result, crews may find procedures impractical or irrelevant. When this happens, the SMS loses credibility and crews begin to rely on informal practices instead.

Internal audits and management reviews are meant to identify such problems early, yet many companies do not use these processes effectively. Some internal audits focus heavily on paperwork rather than observing real practices. Others fail to follow up on corrective actions. When internal learning is weak, external audits inevitably expose the same issuesThis .

The chapter concludes by reminding the reader that safety systems succeed when people believe in them and understand their purpose. For this reason, the findings of this chapter are essential for the next part of the programme, which focuses on risk-based thinking. Before learners can understand how to manage risks, they must understand why systems fail and why consistent safety behaviour is necessary for effective maritime operations.



Main elements of Quality Assurance and Control (Source: Ziarati et al 2025)

Risk Based Approach to Maritime Safety

Chapter 4 explains why risk awareness is central to safe maritime operations and shows how a structured risk-based approach strengthens decision making at every level of a company.

Although the ISM Code requires companies to identify risks and establish safeguards, real accidents and audit findings reveal that risk assessment is still inconsistently applied. This chapter gives learners a practical understanding of how to recognise hazards, how to evaluate them and how to use that knowledge to guide safe behaviour.

Risk assessment is not a single document. It is a way of thinking. The chapter introduces four levels of risk assessment that work together. The first level takes place at the company level, where generic risks are identified during SMS development. These assessments guide the creation of standard procedures. The second level occurs onboard, where task based risk assessments examine the specific hazards involved in an operation. The third level involves toolbox talks. These discussions allow crews to clarify roles, consider environmental conditions and confirm that everyone understands the plan. The fourth level is personal or dynamic risk assessment. This involves individuals taking a moment to evaluate the situation before beginning work, recognising that real conditions may differ from what was originally planned.

The chapter highlights several common weaknesses found in risk assessments. Many do not consider human factors such as communication barriers, experience levels or team dynamics. Others fail to address behavioural risks like complacency or time pressure. Some companies use risk assessments only as paperwork rather than as a practical tool to guide safer work. As a result, crews may not see their value and may treat them as a formality.

Effective risk management requires more than identifying hazards. It requires communicating them clearly, planning operations thoughtfully and creating an environment where people feel confident to stop work when conditions change or when something does not seem right. This is why the chapter places strong emphasis on the human element. Decisions are made by people, not procedures, and people need awareness, confidence and support to make safe choices.

For the OPTIMISM Programme, this chapter provides a foundation for understanding why risk-based thinking is essential for both routine and complex operations. It also prepares learners for the behavioural challenges explored in later chapters and equips them to interpret risk realistically rather than theoretically.

The Human Element and Safety Culture

The second half of Chapter 4 focuses on the human and cultural factors that shape safety on board. It argues that even the best procedures cannot prevent accidents unless people understand their responsibilities, communicate openly and work within an environment that values safe behaviour. This part of the chapter helps learners recognise that safety culture is not an abstract idea. It appears in daily conversations, in decisions made under pressure and in the willingness of individuals to speak up when something does not feel right.

Several elements of safety culture are discussed in depth. Leadership plays a major role. When senior officers demonstrate interest in safety, take time to guide their teams and encourage honest reporting, crews are far more likely to follow procedures consistently. On the other hand,

if leaders ignore safety concerns or focus only on operational speed, crews may adopt risky shortcuts. The chapter also highlights the importance of trust. People must feel comfortable admitting mistakes or uncertainties. When fear exists, information is hidden and learning is lost.

Communication is identified as another core component. Many serious incidents have occurred because key information was not shared or because assumptions were made about what others understood. Effective communication requires clarity, confirmation and active listening, not simply giving orders. The chapter encourages learners to pay attention to tone, timing and mutual understanding during operations.

Another important topic is just culture. This concept recognises that not all mistakes are the same. Human error is natural and should be treated differently from reckless or negligent behaviour. A fair and balanced approach to accountability encourages people to report hazards and incidents honestly. When reporting is discouraged, organisations lose the opportunity to learn and risks remain hidden.

The chapter also introduces the idea of knowledge management. Lessons from accidents, near misses and audits must be shared widely and incorporated into training, procedures and planning. Without a structured system for learning, companies repeat the same mistakes across fleets and generations of crews.

By exploring these concepts, This chapter prepares learners to think beyond checklists. It encourages them to consider how behaviour, communication, culture and leadership shape every aspect of maritime safety. This understanding forms the foundation for the organisational improvements discussed in Chapter 5.

Factors Putting Pressure on Mental Health at Sea

Physical	Psychological	Behavioural
Fatigue	Anxiety or distress	Increased smoking and drinking
Indigestion/upset stomach	Treafulness	Using recreational drugs
Headaches	Feeling low	Withdrawal
Appetite and weight changes	Indecision	Resigned attitude
Joint and back pain	Loss of motivation	Irritability, anger or aggression
Changes to sleep patterns	Loss of humour	Over excitement or euphoria
Visible tension or trembling	Increased sensitivity	Restlessness
Nervous trembling speech	Distraction or confusion	Apparent over reaction to problems
Chest or throat pain	Difficulty relaxing	Working for long hours
Sweating	Lapse in memory	Intense or obsessive activity
Constantly being cold	Illogical or irrational thought processing	Repetitive speech or activity
	Suicidal ideation	Impaired inconstant performance
	Responding to experiences, sensations or people not observable to others	Uncharacteristic errors
		Increased sickness or absence
		Uncharacteristic problems with colleagues
		Risk-taking
		Disruptive or anti-social behaviour
		Lateness, leaving early or extended lunches/meals

Key factors putting pressure on mental wellbeing (Ziarati et al 2025)

SAGA Gap Analysis

Chapter 5 introduces the Tanker Management and Self-assessment framework, a voluntary but influential system developed by the Oil Companies International Marine Forum. While the ISM Code sets minimum requirements for safety management, the SAGA framework guides companies toward higher levels of performance. It encourages organisations to move from basic compliance to measurable excellence through a structured series of stages. This chapter shows how companies can use SAGA to identify gaps in their systems and to strengthen leadership, competence and operational reliability.

SAGA is divided into a set of elements that cover key aspects of maritime operations. These include leadership commitment, personnel management, vessel reliability, navigational safety, cargo and mooring operations, incident investigation and change management. Each element contains key performance indicators and best practice guidance. Companies can evaluate their performance against these indicators and determine whether they meet the expectations for Stage 1, Stage 2, Stage 3 or Stage 4. Higher stages require more evidence, stronger systems and deeper cultural engagement.

A major finding of the chapter is that many companies remain at the lower stages of SAGA because they have not yet developed strong internal processes for learning, communication and risk management. For example, leadership involvement may be limited, with senior managers not fully engaged in safety reviews or ship visits. In some organisations, training focuses on fulfilling mandatory requirements rather than developing long term competence. Other gaps appear in maintenance systems, data management and the ability to analyse fleet wide trends.

The chapter emphasises that SAGA is not a compliance tool. It is a roadmap for continuous improvement. It challenges companies to demonstrate not only that procedures exist but that they work effectively in practice. This includes maintaining reliable maintenance systems, conducting meaningful appraisals, supporting career development, performing structured navigational audits and ensuring that all operational processes are carried out consistently across the fleet.

For learners, Chapter 5 provides a broader view of what excellence looks like in the maritime sector. It reinforces the idea that safety must be actively managed, reviewed and improved over time. SAGA encourages companies to take ownership of their performance and to invest in the people, systems and culture that support safe operations. SAGA is developed to ensure identified causes of accidents and incidents at sea do not repeat themselves in new accidents.

Legend • = Applies

NO	Vessel	Accident type	Working Environment				Personal										Leadership				Organisation						
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1		Loss of Stability								•	•	•	•		•		•	•	•	•		•	•	•	•		•
2		Human Factor			•	•									•		•	•	•				•			•	
3		Collision			•						•						•	•	•		•	•	•	•	•	•	•
4		Operational Accident		•	•					•			•				•	•	•		•	•	•		•	•	
5		Operational Accident		•	•									•				•	•		•	•	•			•	
6		Collision		•			•											•			•	•	•				•
7		Grounding		•									•				•	•			•	•	•	•		•	•
8		Collision		•						•			•		•			•			•	•	•			•	
9		Grounding								•			•	•				•	•		•	•		•			
10		Capsize		•			•	•	•	•	•		•	•	•		•	•	•	•	•	•		•			•
11		Capsize and Grounding							•	•	•						•	•	•		•	•	•	•	•		
12		Fall from 18m height	•		•					•			•	•			•	•									
13		Overflow and Pollution		•	•					•	•				•			•	•	•				•			
14		Collision		•	•					•			•					•	•								
15		Ent. Into enclosed space							•	•	•		•	•	•		•	•	•		•	•	•	•			
16		Ent. Into enclosed space							•	•				•			•	•	•			•	•				
17		Operational Accident		•						•			•		•		•	•	•		•	•	•	•			
18		Operational Accident		•			•			•			•	•	•		•	•	•	•	•	•	•	•	•	•	
19		Operational Accident		•						•				•				•						•			
20		Grounding					•	•	•	•	•			•			•	•	•	•	•	•	•	•			•
21		Fire in Engine Room		•					•			•	•					•			•	•	•	•			
22		Collision			•							•	•														
23		Sinking while Towage	•	•	•				•	•	•										•	•					
24		Container over board	•	•								•	•	•							•	•	•	•			
25		Collision		•								•	•	•			•										
26		Accident in Drills							•	•								•	•			•	•				
27		Lifeboat Failed			•																						
28		Lifeboat Failed			•																						
29		Engine Room Accident						•	•		•																
30		Overboard Accident	•	•					•	•							•	•			•	•	•	•	•	•	
31		Collision										•	•	•	•												
32		Crew Member Died	•									•	•									•		•			
33		Man fell overboard																									
34		Man fell from height																									
35		Operational Accident		•					•									•	•								
36		Operational Accident	•							•			•					•							•		
37		Operational Accident	•	•					•	•		•							•								
38		Operational Accident		•					•	•			•				•	•	•			•	•				
39		Death of Passenger			•																					•	
40		Operational Accident							•				•		•			•	•		•	•	•	•			
TOTAL			7	19	12	1	4	3	14	21	9	8	19	12	10	0	16	27	20	5	18	23	24	16	7	9	6

Analysis of 5 accidents to identify the main route causes and contributing factors (Source: Rodriguez, et al 2005)

Virtual Reality Applications for Maritime Training

Chapter 6 introduces virtual reality as a powerful tool for maritime safety training. It explains how immersive simulation can bridge the gap between theoretical instruction and practical competence. Traditional training often relies on classroom teaching, written procedures and occasional drills. While these methods provide knowledge, they may not fully prepare seafarers for the complexity and pressure of real emergencies. VR training offers a safe environment where learners can practise critical tasks, make decisions and experience the consequences of their choices without real danger.

The chapter describes how accident analysis guided the design of VR scenarios. More than one thousand accident reports were reviewed, and the most severe and recurring cases were selected for simulation. This ensures that training focuses on real industry challenges rather than hypothetical risks. Enclosed space entry was chosen as the primary scenario because these accidents remain a leading cause of fatalities. Additional modules cover gas detection, PPE selection, fire classification and the correct use of extinguishers.

Virtual Reality: A cost-effective means of ensuring safety

VR offers several advantages for safety training. It allows learners to repeat tasks until they gain confidence. It provides instant feedback on mistakes, reinforcing correct behaviour. It also recreates stress, time pressure and environmental distractions, helping trainees learn how to stay calm and focused during complex operations. Because VR does not involve real equipment, it allows trainees to practise hazardous tasks without physical risk.

The chapter explains that VR is not intended to replace traditional training. Instead, it enhances learning by making procedures meaningful. Trainees see the consequences of skipping steps, failing to communicate or misjudging hazards. This practical insight strengthens the behavioural side of safety management and helps learners internalise correct practices.

By linking accident data to realistic immersive scenarios, this Chapter demonstrates how modern training technology can transform maritime education. It prepares seafarers to recognise hazards, respond effectively and remain aware even in routine situations.

Conclusion: Integrating Knowledge, Culture and Practice

Each chapter contributes a different perspective, yet they all point toward the same conclusion. Effective maritime safety depends on more than regulatory compliance. It relies on people who understand risks, communicate clearly, follow procedures with purpose and learn from experience. The programme provides a comprehensive and integrated approach to achieving this goal.

Chapter 1 establishes the regulatory foundation by explaining the structure and purpose of the ISM Code. Chapters 2 and 3 reveal the real-world consequences of weak safety systems through accident and audit findings. They show how recurring failures often arise from predictable patterns, cultural influences and gaps in operational awareness. Chapters 4 and 5 highlight the behaviours, leadership qualities and management practices needed to build stronger safety cultures. Chapter 6 brings these lessons to life through immersive VR training that transforms knowledge into practical skill.

Taken together, the six chapters form a progressive learning pathway. Learners begin by understanding the purpose of safety management. They then explore how accidents happen and how audits identify weaknesses. They learn to apply risk-based thinking and examine what best practice looks like through the SAGA framework. Finally, they develop practical competence through realistic training scenarios. The OPTIMISM Programme encourages a proactive approach to safety. It helps seafarers and managers recognise early warning signs, communicate effectively and maintain awareness during routine and time pressured tasks. It also supports organisations in developing systems that learn, adapt and improve over time. The integration of accident data, behavioural insight and immersive training makes the programme relevant to all levels of the maritime industry. This final chapter reinforces the central idea of the course. Safety is not created through documentation alone. It is created through people who understand their responsibilities, think critically, respect procedures and work together to prevent harm. The OPTIMISM Programme equips learners with the knowledge and confidence needed to contribute to safer maritime operations.