THE HUMAN FACTOR IN THE ERA OF INDUSTRY 5.0

Organizational Behavior, Leadership, and Education in the Maritime and Inland Waterway Transport

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This study follows the transformation of organisational behaviour into a human compass within the maritime domain in the era of Industry 5.0.

Because in the end, every technology is only as strong as the humanity that guides it.

Anna Karadencheva

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INTRODUCTION

Organizational behavior embodies the dynamic relationship between the individual and the organization, within which professional identity and competence unfold. Under the influence of Industry 5.0, this relationship is transformed into a process of continuous adaptation-a process that encompasses new forms of individual development, team interaction, cultural contexts and organizational models, measurable through the parallel growth of both the individual and the organization.

Organizational behavior represents the living fabric of every organizational system-the continuous flow of perceptions, emotions, decisions and interactions through which professionals construct meaning in the environments in which they work. This fabric is never static: it evolves alongside technological advancements, market transformations, the multicultural nature of teams and the new forms of interdependence that shape the working reality of the twenty-first century.

In the waterborne transport sector, these processes acquire particular significance. This is an environment in which technological intensity, operational responsibility, global mobility and cultural diversity coexist within a single professional space. Maritime crews, logistics structures and shore-based operations form a complex network of human and technological components, in which organizational behavior determines not only efficiency but also safety, sustainability and social cohesion. Industry 5.0-guided by the principles of human-centricity, adaptability, social innovation and technological integration-transforms not only the tools of work but also the very logic of interaction between people and systems.

This monograph is grounded in the understanding that in the era of Industry 5.0, the human factor is not merely an organizational component-it is a strategic resource, a driver of innovation and a guarantor of sustainable development. Therefore, the aim of this work is to develop a comprehensive, empirically grounded and conceptually coherent model of organizational behavior in the waterborne transport sector, reflecting the interdependence among individual competencies, team dynamics, organizational culture and the educational environment.

The monograph examines the human factor through four interconnected levels: individual, team, organizational and educational. Through the integration of these levels, the Hybrid Human Factor Model for Industry 5.0 is formulated-a theoretical and applied framework that unites the psychological, social, technological and educational dimensions of organizational behavior. This research demonstrates that the sustainable development of the maritime sector cannot be achieved solely through automation, digitalization or structural reforms: it requires the cultivation of leadership competencies, emotional and social intelligence, intercultural communication skills, organizational learning and an environment that supports the professional identity of the individual.

The structure of the monograph follows the logic of the scientific research process.

Chapter One establishes the theoretical framework by analyzing organizational behavior as a multilayered system in which technological, social, psychological and cultural factors shape professional dynamics.

Chapter Two presents the methodological concept, grounded in humanistic philosophy and pragmatic scientific tradition, and justifies the analytical reliability of the chosen approach.

Chapter Three develops the empirical study-a quantitative analysis that identifies the actual relationships between competencies, team mechanisms, cultural characteristics and organizational outcomes.

Chapter Four outlines the educational strategies and the role of Executive Education as a driver for preparing a new generation of maritime leaders capable of managing the complexity of Industry 5.0.

Chapter Five translates the concepts into practice through the development of Executive Education and Executive Training programs, demonstrating the applicability of the model and providing concrete tools for advancing human capital.

The combination of theoretical depth, empirical rigour and practical applicability positions this monograph as a comprehensive study of the role of the human factor in the era of Industry 5.0. At its core lies the understanding that in a world shaped by algorithms, autonomous systems and digital ecosystems, it is ultimately human qualities-leadership, empathy, critical thinking, cultural intelligence and social responsibility-that will determine the sustainable transformation of organizations.

The purpose of this work is not only to describe this transformation but also to propose a model through which organizations and educational institutions can systematically develop human potential in the waterborne transport sector. This constitutes a contribution both to the scientific literature on organizational behaviour and to managerial practice, workforce training and the strategic development of the sector within the context of Industry 5.0.

CHAPTER I

THEORETICAL FOUNDATIONS OF ORGANIZATIONAL BEHAVIOR IN THE MARITIME AND INLAND WATERWAY TRANSPORT SECTOR WITHIN THE FRAMEWORK OF INDUSTRY 5.0

Organizational behaviour explores how individuals perceive, think, communicate, make decisions, and adapt to the environments in which they work (Schein, 2017; Robbins & Judge, 2019; Colquitt, LePine & Wesson, 2021; Rautrao & Nille, 2025). Within the maritime and inland waterway transport, these processes take on particular importance, as human interaction unfolds in contexts marked by high technological dependence, cultural heterogeneity, and a constant demand for coordination and accountability (Kalinov, Mednikarov & Kanev, 2014).

This chapter examines the evolution of organizational behaviour under the influence of Industry 5.0-moving from the emerging synergy between humans and intelligent technologies, through the dynamics of teamwork and leadership, to the educational and competency-based dimensions of human capital (Carayannis et al., 2022; Tyagi et al., 2023; Hasani et al., 2025).

It offers more than a theoretical overview; it serves as a reflection on the human condition in the digital age, emphasizing the indispensable balance between rationality and humanity-without which technological advancement risks losing its social purpose.

The chapter's focus is multidimensional: it traces the development of organizational behaviour within the highly technological systems of maritime and inland waterway transport; analyses the interaction between the human factor and intelligent technologies; and explores the relationship between organizational culture, values, and sustainability. Central attention is given to the role of leadership and soft skills as pillars of collective ethics and organizational effectiveness, as well as to the educational perspective through which knowledge of organizational behaviour becomes a resource for both professional growth and personal development.

Ultimately, the first chapter does more than systematise theoretical perspectives-it builds a dynamic framework for understanding the individual and the organization in the era of Industry 5.0. In this new epoch, behaviour is no longer merely a reaction to change, but a creative response-a manifestation of the human capacity to think, to innovate, and to lead within a world of continual transformation.

1.1. Organizational Behaviour in Maritime and Inland Waterway Transport

Organizational behaviour in the maritime and inland waterway transport sector is a complex web of human, technological, and structural interactions, where multiple professional domains converge: shipping operations, port management, logistics, and the cruise industry. Rather than a set of isolated processes, this environment forms a self-regulating system in which human behaviour, decision-making patterns, and communication dynamics shape the rhythm and performance of the entire sector.

The sector is marked by a distinctive level of complexity: continuous movement, spatial isolation, cultural diversity, and intense technological integration (Velikova, Nedeva & Stoyanov, 2024; Nedeva, 2021). Consequently, organizational behaviour in this context cannot be understood merely as a managerial function. It constitutes a socio-psychological and cultural system that embodies the very essence of human presence in a technologically advanced era.

The behaviour of individuals and teams in maritime and inland waterway transport has a profound influence on both organizational functioning and organizational culture (Kalinov, 2016). Whether on board a vessel, within a logistics hub, or in a cruise company, behaviour is never incidental. It reflects underlying values, perceptions, and shared norms. It serves as the invisible architect of safety and trust-a critical link between technological reliability and human responsibility.

1.1.1. Levels and Dimensions of Organizational Behaviour

In the era of Industry 5.0, organizational behaviour ascends to a new dimension-evolving from a conventional managerial tool into an expression of a profoundly human-centric philosophy. The emphasis shifts from control to collaboration, from output to meaning, and from mere rationality to conscious, reflective presence. Technologies cease to function as external instruments and instead become active partners in decision-making;

leadership transforms into an act of humanity, while adaptability emerges as a defining marker of professional maturity (Schein, 2017; Robbins & Judge, 2019; Gibson et al., 2012; Senge, 2006).

Within the maritime and inland waterway transport sector, this paradigm shift necessitates a reimagining of team dynamics on board, the relationship between people and intelligent systems, and leadership styles that foster psychological safety and continuous organizational learning. These new realities demand more than technical proficiency: they call for elevated levels of social and emotional intelligence, intercultural competence, and behavioural flexibility-essential components of human capital in the 5.0 era.

This evolution underscores the need to interpret organizational behaviour through three interconnected levels of analysis (Figure 1.1), which collectively shape the systemic framework of management and human interaction within the maritime and inland waterway transport sector.

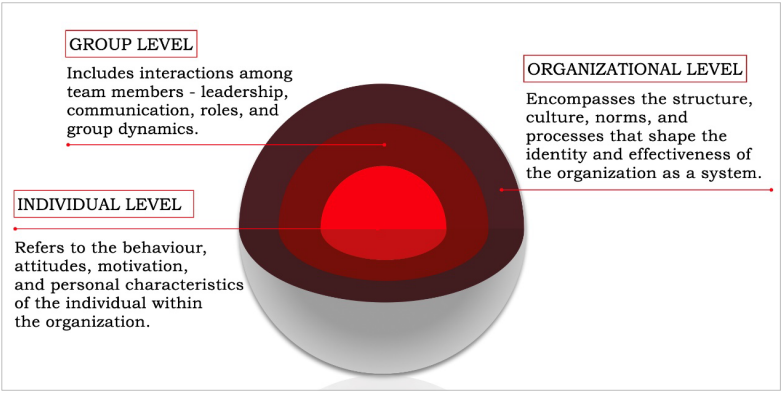

Figure 1. 1 Levels of Organizational Behaviour

In the maritime industry, these levels do not function independently but intertwine within a dynamic network of social, technological, and cultural interdependencies.

At the individual level, human engagement with technologically advanced maritime systems is evolving toward greater cognitive and behavioural sophistication. Professionals are now required to interpret complex digital interfaces, interact with algorithmic processes, and make real-time decisions under conditions of uncertainty (Sivkov, 2020). At the same time, they must exhibit emotional intelligence, communicative adaptability, and intercultural awareness-competencies increasingly recognized as essential within the modern maritime workforce (Narleva, Gancheva & Narlev, 2024).

In the logistics domain, shore-based operators manage global supply chains through highly integrated digital platforms, where even minor inaccuracies may trigger cascading operational disruptions. These dynamics align with European policies aimed at

modernization and sustainable logistics development (Bakalova, 2024; Grancharova, 2023), as well as with the standards of multimodal transport networks (Grancharova, 2021). Within this environment, sustainable ship supply models are viewed as vital for reducing environmental impact while maintaining operational continuity (Stefanova, 2025). Automation reshapes not only operational workflows but also the risk landscape-particularly in the realm of cybersecurity, which has become a central vulnerability of modern maritime systems (Krastev, 2022). Consequently, individual behaviour must integrate technological proficiency with ethical judgment and emotional maturity: the human remains the critical counterbalance to automation (Hollnagel, 2017).

From the group perspective, technological advancement transforms not only the role of the individual but also the fundamental nature of team interaction. High-tech maritime environments demand continuous coordination, shared situational awareness, and deep mutual reliance. On the bridge, navigators must maintain precise alignment despite high levels of automation. In the engine room, engineers and technicians depend on collective decision-making during alarm conditions. In ports and logistics centres, multidisciplinary teams-IT experts, operators, managers, and data analysts-function as interconnected units operating within culturally and linguistically diverse settings (Belev et al., 2017; Narleva & Velinov, 2024; Gramchev & Dimitrakieva, 2022).

In the cruise sector, group dynamics become even more intricate. Crew members not only work together but also live together, inhabit limited physical space, and share collective responsibility for passenger safety and satisfaction. Psychological safety, therefore, becomes indispensable-the shared belief that individuals can speak up, take risks, learn, and make mistakes without fear of blame or reprisal (Reason, 1997; Schein, 2017; Lechner & Mortlock, 2022). It forms the cornerstone of collective effectiveness in digitally intensive environments.

Moreover, on cruise vessels, interaction with passengers introduces an additional emotional and social layer. Crew members must display not only professional competence but also empathy, cultural sensitivity, and resilience under sustained pressure. In this sense, the group level serves as a bridge between individual capabilities and the broader organizational culture, transforming personal competencies into coherent, effective collective performance.

At the organizational level, the maritime sector is transitioning from rigid hierarchical structures to more dynamic, networked, and collaborative ones. Leadership is no longer defined primarily by authority but by the capacity to communicate, inspire, and facilitate. In high-technology environments, leaders serve as integrators of human and technological capital (Kotter, 2012; Carayannis & Morawska-Jancelewicz, 2022), aligning diverse teams around shared purposes, values, and long-term vision.

Within this evolving landscape, organizational culture emerges as a strategic determinant of success-shaping whether technologies will function as catalysts for synergy or become sources of friction. Organizations that cultivate openness, continuous learning, and trust create resilient environments characterized by adaptability and a strong collective identity (Kalinova, 2022).

In both commercial and cruise shipping, technological interconnectedness reinforces social interconnectedness. Teamwork evolves from task-based coordination to intelligent collaboration, where individuals share information, responsibilities, and situational awareness in real time (Atanasova & Teofilova, 2023).

Organizational behaviour unfolds across multiple interconnected dimensions that define how individuals perceive their environment, interact with others, and generate value within the maritime domain. Contemporary literature emphasizes not only structural distinctions but also a multidimensional framework encompassing technological, social, psychological, and cultural components (Schein, 2017; Robbins & Judge, 2019; Carayannis & Morawska-Jancelewicz, 2022).

The technological dimension captures the degree to which interactions between humans and intelligent systems influence behaviour and decision-making. In the era of Industry 5.0, this dimension gains strategic prominence: maritime professionals must balance automated processes with human intuition, preserving situational awareness and maintaining control over safety-critical operations (Hollnagel, 2017).

Modern environmental technologies further illustrate the evolving role of intelligent systems. For example, unmanned aerial vehicles equipped with thermal and multispectral sensors are increasingly used to detect and monitor plastic pollution on the sea surface-enhancing sustainable maritime governance and expanding the scope of human interpretation within technologically saturated ecosystems (Tsvetkov, 2023).

Similarly, the transformation of communication and information systems within naval structures underscores the strategic significance of digital platforms in shaping new patterns of interaction, decision-making, and operational coordination in the maritime domain (Nikolov, 2022; Nikolov, 2024). Ensuring the security of the maritime and inland waterway transport system, meanwhile, requires a nuanced understanding of the complex risks and threats that shape the operational environment and influence the organizational behaviour of maritime institutions (Stoyanov, 2017;2018).

The social dimension encompasses the dynamics of relationships, communication, and teamwork. In the multicultural, globally interconnected maritime industry, organizational effectiveness depends on the quality of social ties and the ability to build trust in remote or hybrid work environments (Gibson et al., 2012; Edmondson, 2019). Psychological safety and open communication become key factors for collective performance (Stoyanov, 2008), especially on board, where shared living and working conditions require heightened social awareness. Beyond social dynamics, the individual's internal psychological world also plays a significant role, shaping their ability to adapt and collaborate effectively.

The psychological dimension encompasses internal attitudes, motivation, emotions, and moral orientations that influence individual and group behavior. According to Senge (2006), organizations that encourage self-reflection and personal development cultivate a more resilient and adaptive culture. In the maritime environment-characterized by high demands and extended periods of isolation-emotional intelligence and stress resilience are among the most valuable behavioral competencies.

The cultural dimension relates to the values, norms, and symbols that shape the identity of maritime organizations. In a context of international mobility and multicultural crews, organizational culture serves as an integrating framework that brings meaning and predictability to behavior (Schein, 2017). Companies that deliberately cultivate a culture of trust, respect, and learning develop "social resilience"-the capacity to maintain cohesion and engagement even in environments of constant change (Kotter, 2012; Carayannis & Morawska-Jancelewicz, 2022).

The interaction among these four dimensions defines the complex nature of organizational behavior in maritime and inland waterway transport. It is simultaneously technological and human, rational and emotional, individual and collective-a system in which the human factor remains the central carrier of adaptability, creativity, and ethical responsibility.

1.1.2. Human-Centric Transformation of Organizational Behavior

Industry 5.0 introduces a qualitative shift in how interactions between humans and emerging technologies are conceptualized, as well as in how people relate to one another within an increasingly dynamic and uncertain global environment. Whereas Industry 4.0 centers on digitalization, cyber-physical systems, and artificial intelligence, Industry 5.0 adds a new and indispensable dimension-humanization, or the reintegration of human values into technological advancement.

Rather than rejecting automation, Industry 5.0 seeks to harmonize it with human creativity, ethical judgment, and emotional intelligence. Its ambition is not to replace the human through intelligent systems, but to empower the human through meaningful collaboration with technology-restoring the balance between operational efficiency and human well-being (Xu et al., 2021; Nahavandi, 2019).

Structural Transformation - From the Machine to the Human

The transition from Industry 4.0 to Industry 5.0 can be understood as a shift in the centre of gravity within the industrial system pyramid (illustrated in Figures 1.2 and 1.3).

In the Industry 4.0 paradigm, the machine occupies the apex of the system. It sets the pace, dictates the processes, and embodies the transformative force of the digital revolution. The overall logic is one of automation: systems are driven by algorithms, data flows, and predictive models, all oriented toward maximizing efficiency, precision, and speed. The human remains present but often in a limited role-primarily as an operator, supervisor, or monitor of automated processes rather than a fully empowered and equal actor within the system.

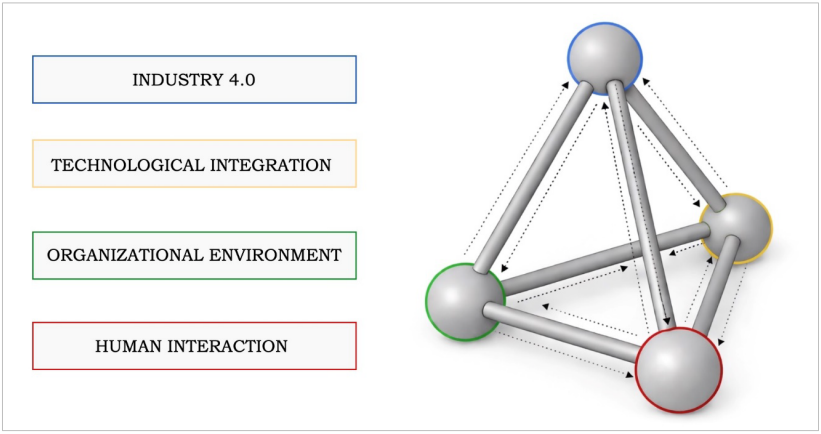

Figure 1. 2 Tetrahedral Model of Industry 4.0

With the advent of Industry 5.0, this pyramid is symbolically and conceptually inverted-the human ascends to the top. The system's focal point is no longer the machine, but human interaction itself: the arena in which technology encounters empathy, creativity, and moral responsibility. In this reoriented landscape, technological systems do not dominate human agency; instead, they are designed to amplify it, enabling individuals to engage more meaningfully, think more critically, and act with greater ethical awareness.

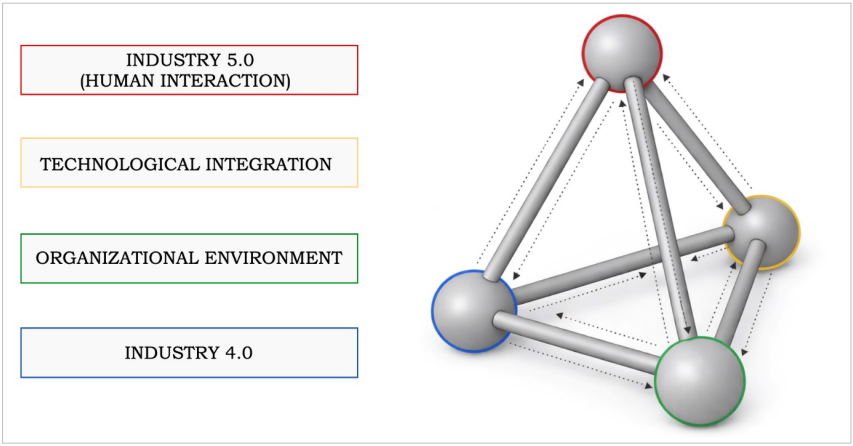

Figure 1. 3 Tetrahedral Model of Industry 5.0

The shifting of the pyramid's centre signifies a profound transformation-from technology-driven development to a genuinely human-centric paradigm. It marks a transition from a world directed by machines to one in which technologies are intentionally designed to serve the human being and uphold human values.

In this context, it becomes essential to outline the key principles of Industry 5.0, which fundamentally redefine the place of technology within the industrial ecosystem: human-centrism, sustainability, and resilience to disruptions (European Commission, 2021).

Building upon these foundational pillars, several authors (Nahavandi, 2019; Xu et al., 2021; Carayannis & Morawska-Jancelewicz, 2022) propose three complementary principles-human–cobot collaboration, ethical and responsible technologies, and industrial humanity. Together, they articulate the deeply human-focused nature of the emerging industrial paradigm.

Collectively, these principles shape a new vision of *industrial humanity* (Figure 1.4): a world in which technologies do not replace human beings but instead enable them to become *more fully human*.

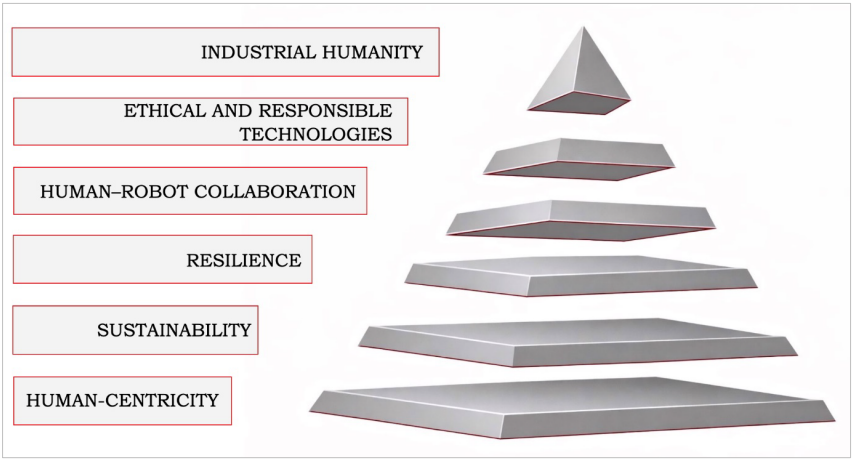

Figure 1. 4 Pyramid of the Key Principles of Industry 5.0

The pyramid illustrates the interconnected nature of the core dimensions of Industry 5.0. At its foundation lies human-centrism, which positions technology as an instrument for unlocking human potential-an ally rather than a rival. Built upon this foundation is sustainability, encompassing not only environmental considerations but also the social dimensions of industrial development. Production in the era of Industry 5.0 must align with the preservation of natural resources, social equity, and societal well-being. Above it stands flexibility and resilience, highlighting the capacity of industrial systems to adapt to and recover from disruptions. This resilience extends beyond the technological sphere to include organizational and social robustness-the ability to learn from uncertainty and transform crises into opportunities for innovation and progress.

Human–cobot collaboration and ethical, responsible technologies represent the intelligent interaction and moral parameters of technological advancement. At the apex stands *industrial humanity*-a symbol of the synthesis between innovation and values, between efficiency and meaning.

This new and distinctive form of collaboration between humans and technology presupposes a fundamental transformation in the way organizations design their processes, structures, and cultures (Koritarov, 2025). As machines assume repetitive and routine tasks, humans focus on activities that require creativity, ethical judgment, interpretation, and strategic thinking.

In this way, the foundations are laid for new models of human cooperation based on transparency, shared responsibility, and collective intelligence. Within the context of maritime and inland waterway transport, this requires rethinking how people interact in complex, multicultural, and technologically intensive environments-both on board vessels and within shore-based institutions, transport management organizations, and the broader ecosystem of maritime and inland waterway services, including tourism.

Personnel are expected not merely to execute assigned tasks but also to actively participate in innovation, demonstrate critical thinking, and adapt fluidly to technological change. A clear trend emerges toward increasing individual contribution and the strategic importance of each person's role-regardless of hierarchical position. Whereas in earlier stages the value of employees was measured by their ability to follow instructions, today it is understood as a strategic asset that must be nurtured through education, leadership, and continuous development of human capital-a key factor in organizational sustainability and innovation capacity.

This shift gives rise to a new form of organizational behaviour-one oriented toward collaboration, learning, and resilience, where team dynamics and interpersonal relationships become strategically significant for safety, efficiency, and innovation.

The transformation of organizational behaviour in maritime and inland waterway transport also requires a reimagining of leadership-from directive and controlling approaches to transformational and humanistic ones. Modern leaders serve as mediators between technology and people (Kotter, 2012; Carayannis & Morawska-Jancelewicz, 2022), between strategic priorities and human needs. They cultivate cultures of learning, knowledge sharing, and continuous improvement-pillars of organizational resilience in the age of Industry 5.0.

Thus, the transformation of organizational behaviour in the maritime transport sector is not simply a response to technological change but a profound cultural and value-driven evolution. It demands that organizations balance innovation with humanity, efficiency with well-being, and digital transformation with social responsibility. This means creating institutions that integrate humans and technology into a coherent and sustainable ecosystem (Carayannis & Morawska-Jancelewicz, 2022).

It is this balance that determines the sector's capacity to cultivate sustainable human resources and to respond effectively to the new realities of the global transport system-and it is this very balance that stands at the heart of the present monograph.

The following analytical step is therefore to explore how the human-centric paradigm of Industry 5.0 reshapes organizational culture in maritime and inland waterway transport, transforming it from a managerial instrument into a dynamic system of values, meanings, and interactions.

1.1.3. Adaptation of Organizational Culture to the Conditions of the New Industrial Era

At the foundation of organizational behaviour in maritime and inland waterway transport lies a professional maritime culture shaped by long-standing traditions, firm discipline, and rigorous safety standards. Today, however, this culture is undergoing a significant transformation-shifting from a model grounded in Hierarchy and control toward one that fosters flexibility, learning, and creativity. Adapting to rapidly evolving technologies and global market pressures requires change not only in managerial structures but also in the mindset, attitudes, and values of those working within the sector.

This adaptation is not simply a reaction to external forces; it constitutes an internal process of awareness, re-evaluation, and reconfiguration of values, norms, and behavioural patterns-a process that influences both organizations and individuals (Cameron & Quinn, 2011). In this sense, organizational culture evolves not into a mechanism of control but into a mechanism of empowerment, enabling the development of human potential. It becomes a culture that nurtures trust, shared responsibility, and continuous improvement-elements fundamental to the sustainability and long-term success of organizations in maritime and inland waterway transport (Kalinova, 2019).

According to Schein's model (2017), organizational culture manifests across three interconnected levels: artifacts, espoused values, and basic underlying assumptions. In the maritime transport sector, this transformation encompasses not only visible practices-terminology, safety rituals, operational procedures, communication norms-but also deeper attitudes toward authority, responsibility, error, and success.

At the surface level of **artifacts**, transformation is reflected in the adoption of digital navigation and monitoring tools, collaborative risk assessments, and a communication style oriented toward brief confirmations and coordinated team actions. At the level of **values**, organizations begin shifting from a narrow focus on operational discipline toward a balance between efficiency, learning, and innovation-building a culture of trust, shared responsibility, and adaptability that blends "clan" and "adhocratic" elements. At the deepest level of **basic assumptions**, fundamental understandings evolve: safety becomes a collective obligation, errors are reframed as opportunities for learning, and success is defined not merely by operational performance but by sustainable practices and psychological safety within teams.

These cultural layers manifest differently across subsectors of the maritime domain-maritime management, logistics, and the cruise industry. In maritime management, culture is expressed through formal structures, safety protocols, and standardized communication, with an emphasis on discipline, trust, and a learning-oriented approach to errors. In logistics, the culture prioritizes efficiency, technological integration, and coordination through digital platforms. In the cruise industry, values such as emotional intelligence, customer orientation, and intercultural communication prevail, whereby the passenger becomes an active participant in the experience. Schein's model (2017) thus provides a lens for tracing these cultural variations and their deep cognitive foundations, shaping a distinctive maritime cultural profile capable of adapting to the demands of Industry 5.0.

The shift from a culture of obedience and procedural compliance to one of collaboration and learning requires **double-loop learning**-not simply adjusting existing procedures

but questioning and reshaping the underlying values and assumptions that produce them (Argyris & Schön, 1978). It is this capacity for reflection and adaptation that transforms organizational culture into a key driver of sustainability, innovation, and safety in maritime organizations in the era of Industry 5.0.

Organizations in the maritime and inland waterway transport sector that embrace the principles of Industry 5.0 evolve into **learning organizations** (Senge, 2006; Argyris & Schön, 1978), capable of integrating innovation and human-centric values into their managerial frameworks. In this context, organizational behaviour becomes a strategic instrument of transformation, while leadership serves as the catalyst that enables that change.

To understand how maritime organizations adapt and evolve through learning, it is necessary to examine the mechanisms of organizational learning described by Senge (1990), Garvin (1993), and Argyris & Schön (1996). The learning organization is conceptualized as a continuous cycle of creating, sharing, applying, and reflecting upon knowledge-a cycle particularly relevant to the maritime context. The process begins with the generation and exchange of ideas, followed by the integration of knowledge into operational practices, experimentation, and behavioural adaptation, and concludes with evaluation and renewed learning. In this way, organizational learning becomes a dynamic, self-reinforcing system in which knowledge is constantly produced, transformed, and reapplied-ensuring sustainability, innovation, and the collective evolution of the organization (Figure 1.5).

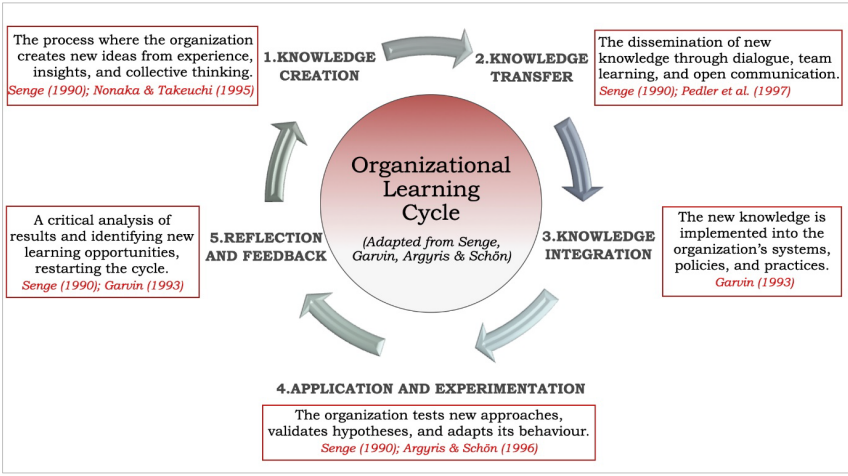

Figure 1. 5 Organizational Learning Cycle According to Senge (1990)

Source: adapted from Senge (1990), Garvin (1993), and Argyris & Schön (1996).

In the era of Industry 5.0, Peter Senge's classical model of organizational learning retains its foundational structure while undergoing a profound transformation shaped by digitalization, artificial intelligence, and the overarching human-centric paradigm (Figure 1.6).

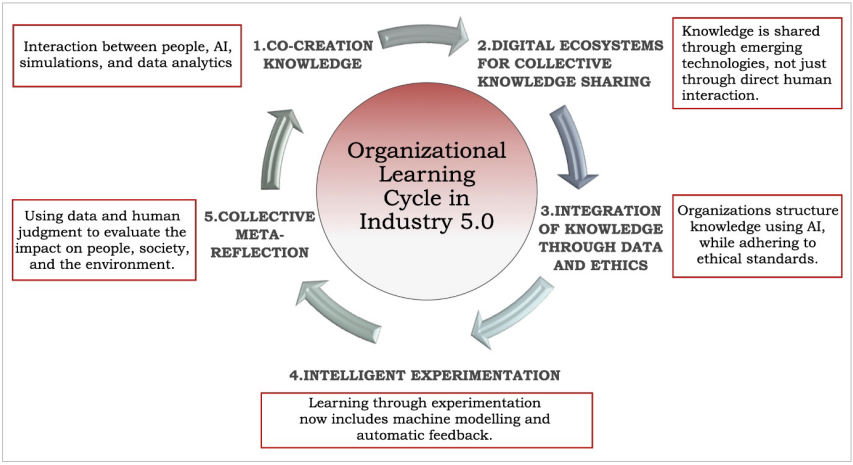

Figure 1. 6 Organizational Learning Cycle in Industry 5.0

Source: author's adaptation based on Senge (1990), Garvin (1993), Argyris & Schön (1996), Longo et al. (2020), European Commission (2021).

The process of knowledge creation is no longer rooted solely in human experience and collective reasoning; instead, it emerges as a process of **human–machine co-creation**. Humans, artificial intelligence, simulation technologies, and data analytics interact synergistically, generating new ideas and solutions. Knowledge thus ceases to be an exclusively human construct and becomes the product of an evolving interplay between human cognition and algorithmic intelligence.

Knowledge sharing is similarly transformed. Whereas traditional models relied primarily on interpersonal communication, in the contemporary industrial landscape, knowledge flows through **digital ecosystems, intelligent platforms, and networked communities**. Collective intelligence becomes the new medium through which insights circulate, accelerate, and scale.

The integration of knowledge also undergoes a fundamental shift. Organizations increasingly rely on artificial intelligence to structure, synthesize, and contextualize information-yet within clearly defined ethical and sustainability frameworks. As a result, knowledge management evolves beyond a technical capability to become a **core component of ethical organizational culture and corporate social responsibility**.

The stage of application and experimentation moves toward **intelligent experimentation**, where digital twins, simulations, and autonomous systems allow organizations to test hypotheses, predict outcomes, and refine their processes with unprecedented precision (Stoyanova & Stefanova, 2025). This marks the emergence of a new form of experiential learning-one grounded in machine modeling, automation, and real-time adaptive feedback.

Finally, the process of reflection and evaluation expands into **collective meta-reflection**. Organizations now combine data analytics, digital monitoring tools, and human judgment

to assess the broader impacts of their actions on people, society, and the environment. Reflection thus transcends the boundaries of the organization, acquiring social, ethical, and ecological dimensions. It becomes not merely an evaluative phase, but a **driving force for sustainability, innovation, and responsible development**.

New Characteristics of the Learning Organization in Industry 5.0

The evolution of organizational learning in the era of Industry 5.0 gives rise to a new type of organization-one that not only adapts to change but actively participates in the *co-creation* of knowledge alongside intelligent technologies. This transformation can be summarized through five defining characteristics:

1. **Human–AI Symbiosis** – Humans are not replaced but *augmented* by technology. Human cognition and artificial intelligence interact to generate a new form of collective cognitive capability.
2. **Collective Intelligence** – Knowledge emerges within networks composed of people and intelligent systems collaborating across and beyond organizational boundaries.
3. **Ethical Learning** – Organizations cultivate ethical awareness and sensitivity to their impact on people, communities, and the environment, integrating values into all phases of learning.
4. **Resilience Through Learning** – Resilience is built by learning from failures, disruptions, and uncertainty, turning crises into opportunities for improvement and renewal.
5. **Continuous Co-evolution** – Humans, technologies, and organizations learn from and with one another continuously, shaping an environment characterized by innovation, adaptability, and shared development.

In Industry 5.0, the learning organization evolves into an adaptive, intelligent system in which humans and technologies jointly create knowledge rather than generate it in isolation. Such an organization does not merely respond to its environment-it actively shapes its future through learning, reflection, and sustainable value creation (European Commission, 2021).

Ethical learning becomes a central pillar of this development, as the creation and application of knowledge are inseparable from values, responsibility, and social impact. Resilience is increasingly understood as a **dynamic capability**-the capacity to learn from errors, disruptions, and transformation-thus ensuring long-term adaptability and innovation (Senge, 1990; Garvin, 1993).

Consequently, organizational learning becomes not only a mechanism for innovation but also a **continuous process of cultural evolution**, through which flexible, ethical, and sustainable maritime organizations emerge-capable of aligning technological progress with human responsibility. The transformation of organizational culture in maritime and inland waterway transport thus outlines a managerial philosophy in which the human factor stands at the center of learning, innovation, and transformation.

Technological advancement alone cannot ensure sustainability if it is not supported by social intelligence, empathy, and the capacity for collaboration-qualities that position humans as active and responsible partners of technology (Demir et al., 2019; Xu et al., 2021). Maritime organizations that cultivate these capabilities achieve higher levels of innovation, employee engagement, and collective resilience.

Therefore, in the era of Industry 5.0, organizational behaviour is shaped not only by structures and technologies but by the human being as a carrier of culture, values, ethics, and interpersonal connectedness. This places renewed emphasis on **soft skills as a strategic determinant** of practical cooperation and safety-a theme explored in the next section.

1.2. Soft Skills as a Factor for Effective Interaction

At a time when technologies no longer simply execute commands but begin to *think* alongside humans and enhance their capabilities, attention inevitably returns to the essence of the human being-intuition, creativity, emotionality, and the capacity for continuous learning. Industry 5.0 embodies this return precisely: a reminder that at the heart of every intelligent system stands not code, but the consciousness, experience, and values of the human who created it.

From this perspective, the human factor becomes the invisible axis around which safety, efficiency, and sustainability revolve. Soft skills emerge as the new compass guiding the modern maritime professional-skills that allow individuals to navigate complexity, collaborate effectively, and maintain clarity and stability in environments defined by technological intensity and constant change.

1.2.1. Soft Skills as a Bridge to Human-Centric Work Design

In the professional environment of the maritime industry, the interaction between humans and technologies is no longer solely a matter of technical competence, but of **cognitive plasticity** and **psychological awareness**. The more intelligent and autonomous systems become, the more essential it is to cultivate soft skills-the *"invisible competencies"* that enable individuals to integrate rational and emotional intelligence to operate technological systems effectively, responsibly, and ethically.

Drawing on the most widely accepted and frequently cited definitions[1] in academic literature, soft skills can be described as *"adaptive human qualities expressed through the capacity for deep, conscious, and meaningful interaction with people and the environment."*

[1]Soft skills are most commonly defined as the personal, social, and communication abilities that enable an individual to interact effectively and harmoniously with others and to adapt to diverse professional environments (Cambridge Dictionary; OECD; UNESCO). According to the World Economic Forum (2020), they encompass a combination of interpersonal abilities, character traits, and emotional intelligence that support effective collaboration and the attainment of shared goals. Harvard Business Publishing further emphasizes that these so-called *"human skills"* include the capacity to connect with others through empathy, compassion, and authenticity. Individuals who possess them are able to build deeper, more meaningful relationships with colleagues and clients—relationships that serve as a foundation for innovation, adaptive thinking, and collaborative problem-solving.

In the maritime context-where technological infrastructures evolve at unprecedented speed, from advanced navigation platforms and partially autonomous vessels to AI-driven safety and risk assessment systems-soft skills attain strategic importance. They become the primary mediator between **human intuition and algorithmic logic**, between **technical precision and human judgment** (Breque, De Nul & Petridis, 2021).

The essence of cognitive soft skills lies in the deliberate management of thought processes-the capacity to analyze, anticipate, and synthesize information within a dynamic, high-technology environment. These skills include critical thinking, analytical reasoning, adaptability, self-reflection, and cognitive flexibility-qualities without which meaningful and safe collaboration with intelligent technologies would be impossible.

Meta-cognitive dimensions-awareness of one's own thinking processes and the ability to regulate them-are equally vital. They allow the maritime professional to identify cognitive biases, recalibrate assumptions, and maintain psychological stability under technological pressure. Thus, technology does not diminish the human role; it encourages the individual to think with greater maturity, depth, and creativity.

To clarify how distinct soft skills *function* within a technologically intensive environment, the following classification illustrates their role as a bridge connecting human thought, emotion, and algorithmic logic.

Table 1. 1 Classification of Soft Skills and Their Role in Human–Intelligent Systems Interaction

Category of Skills	Function in Human–Technology Interaction	Specific Competencies	Manifestations Across Subsectors
Cognitive Skills	Ensure analysis, interpretation, and integration of information from intelligent systems	• Critical and systems thinking • Decision-making under uncertainty • Problem-solving • Predictive thinking	**Maritime management:** analysis of navigational data and risks in automated operations. **Maritime logistics:** assessment of cargo flows and optimisation via AI systems. **Cruise industry:** real-time decision-making for safety and passenger service.
Meta-cognitive Skills	Enable conscious learning and adaptation to technological changes	• Self-reflection • Cognitive flexibility • Conscious use of technology • Data ethics	**Maritime management:** adaptation to new monitoring and management systems. **Maritime logistics:** applying innovations across transport chains. **Cruise industry:** integrating digital services without losing human contact.
Emotional Skills	Regulate internal states and resilience under technological pressure	• Emotional self-regulation • Empathy • Stress management • Psychological resilience	**Maritime management:** maintaining calm during incidents and digital failures. **Maritime logistics:** managing tension during delays and heavy traffic. **Cruise industry:** emotional stability when working with passengers and multicultural teams.
Social Skills	Support effective communication and collaboration in digital environments	• Communication and active listening • Coordination • Working in multicultural environments • Team interaction	**Maritime management:** effective communication between ship crews and shore services. **Maritime logistics:** collaboration among different operators and agents. **Cruise industry:** passenger service and coordination among multinational crews.
Leadership Skills	Guide and motivate teams in hybrid (human–AI) systems	• Visionary thinking • Digital leadership • Ethical management • Facilitating team learning	**Maritime management:** managing mixed human–machine teams. **Maritime logistics:** decision-making during crises and supply chain disruptions. **Cruise industry:** inspiring and coordinating multicultural personnel.
Adaptive Skills	Enable rapid response to technological and organisational changes	• Innovativeness • Flexibility • Change resilience • Real-time thinking	**Maritime management:** responding to emergencies and protocol changes. **Maritime logistics:** adapting to sudden disruptions in supply chains. **Cruise industry:** managing dynamic service processes and passenger expectations.
Ethical and Responsible Skills	Ensure moral and safe use of technologies and data	• Ethical reasoning • Social responsibility • Values-based decision-making • Awareness of technological impact	**Maritime management:** transparency in data management and safety. **Maritime logistics:** balancing efficiency with sustainability. **Cruise industry:** ethical treatment of passengers and staff, especially during crises.

The classification highlights the multilayered role of soft skills as the connecting tissue between human cognition, emotion, and technological logic. It shows that effectiveness in contemporary maritime and inland waterway transport depends not solely on technical competence but also on the synergy among **cognitive plasticity, emotional stability, and ethical awareness**.

One of the most valuable outcomes of developing cognitive soft skills is the activation of **professional creativity**. Emerging technologies do not merely automate processes; they create space for innovation-for "thinking beyond the instruction." In this sense, creativity becomes a natural extension of cognitive flexibility: it enables professionals to propose novel solutions, optimize processes, and generate added value through intuitive and meaningful interaction with technologies (Nahavandi, 2019).

Research on human–technology collaboration confirms that productivity is driven not simply by the presence of automation, but by how individuals integrate it into their mental models and decision-making frameworks (Demir et al., 2019). Maritime professionals who demonstrate strong emotional regulation, self-organization, and analytical reasoning achieve higher levels of effectiveness when operating intelligent systems.

Cognitive soft skills also facilitate **lifelong learning**-a fundamental prerequisite for professionalism in the era of digital transformation (Carayannis & Morawska-Jancelewicz, 2022). They nurture intrinsic motivation, accelerate the acquisition of new technological competencies, and foster a mindset of innovation and continuous improvement.

Thus, technology becomes a **mirror of human thinking**-reflecting not merely what we know, but how we think. Human interaction with technology must therefore be understood not only as a technical engagement, but as a psychosocial process. When technologies are integrated in ways that foster creativity and self-reflection, they do not "dehumanize" work; instead, they render it more conscious, intellectually engaging, and meaningful.

From this synthesis emerges a **new culture of maritime professionalism**-a culture in which technologies do not replace the human being but amplify human potential, enabling individuals to work with greater wisdom, productivity, and creativity.

While interactions between humans and intelligent systems reveal individual cognitive and emotional capacities for adaptation, interactions among people in a digitally connected professional environment introduce an additional dimension: **social dynamics**.

Therefore, the next stage of analysis turns to how soft skills function within a **multimodal environment**, where individuals interact simultaneously with other people and technological intermediaries.

1.2.2. Soft Skills and Collective Intelligence in Human–Technology Interactions

Human interaction in maritime and inland waterway transport has always been the backbone of professional effectiveness. Long before the digital transformation, human factors such as trust, coordination, ethics, and communication clarity determined the success of every operation-whether maritime, riverine, port-based, or logistical.

In the increasingly complex environment of Industry 5.0, organizational effectiveness depends not only on individual capabilities but also on the **collective interaction** between humans and intelligent technologies. This interaction forms what is often described as **team intelligence**-a dynamic system in which human relationships, technological interfaces, and organizational processes intertwine within a shared network of learning, reflection, and adaptation (Senge, 1990; Edmondson, 2018).

To illustrate this interdependence, the following table presents the main categories of soft skills and their functional roles within the integrated environment of human-technological collaboration across the various subsectors of the maritime and shipping industry.

The table demonstrates that in the interaction between humans and technologies, soft skills function as a form of **social infrastructure** that enables joint effectiveness. They link human empathy with algorithmic rationality, creating the conditions necessary for trust, coordination, and adaptability.

Today, however, these relationships develop within a new environment-one that is simultaneously **physical and digital**, where traditional face-to-face communication coexists with technology-mediated interaction.

Table 1. 2 Categories of Soft Skills and Their Function in Human–Human Interaction within a Technology-Enhanced Environment

Category of Skills	Function in Human-Human-Technology Interaction	Specific Competencies	Manifestations Across Subsectors
Communication Skills	Ensure understanding and synchronization among team members in a digital environment	• Active listening • Clear expression • Visual and written communication through digital platforms • Real-time feedback	**Maritime management:** exchange of information between ship and shore via monitoring systems and ECDIS. **Maritime logistics:** coordination between departments and external operators through integrated systems (Port Community Systems). **Cruise industry:** synchronization between service, security, and technical departments.
Cooperative and Collaborative Skills	Support collective work and decision-making in hybrid (human–AI) teams	• Teamwork • Joint problem-solving • Trust and shared responsibility • Conflict management	**Maritime management:** coordination between captain, senior officers, and machine-room personnel via digital reporting systems. **Maritime logistics:** inter-company collaboration within global supply chains. Cruise industry: cooperation among multicultural teams and synchronization for customer experience.
Cultural and Social Intelligence	Facilitate communication and trust among people from different cultures and professional backgrounds	• Empathy • Cross-cultural sensitivity • Tolerance and respect	**Maritime management:** effective interaction among international teams. **Maritime logistics:** communication with international partners and institutions. **Cruise industry:** work with passengers from diverse cultures and
Leadership and Facilitation Skills	Support the development of trust and empowerment in a collective environment	• Motivation and facilitation • Delegation and empowerment • Visionary and emotional leadership • Change management	**Maritime management:** facilitating communication between crews and shore managers. **Maritime logistics:** project and team management in multicultural environments. **Cruise industry:** leadership in service teams and managing emotional dynamics of personnel.
Ethical and Trust-Building Skills	Establish a foundation for collective responsibility and safety in digital ecosystems	• Integrity and honesty • Ethical responsibility • Psychological safety • Trust in human–machine collaboration	**Maritime management:** "Just Culture" of open sharing of errors without punishment. **Maritime logistics:** transparency and accountability in supply chains. **Cruise industry**: ethical communication and trust between crew and passengers.
Collective Intelligence	Synergize human and technological resources in teams for optimal decision-making	• Joint data analysis • Collaboration with AI systems • Shared vision • Knowledge management	**Maritime management:** incident analysis and learning through digital simulations. **Maritime logistics:** use of digital platforms for real-time coordination in supply chains. **Cruise industry:** use of customer data to improve collective service decisions.

In the maritime industry, communication lies at the heart of this interaction. It shapes how information is transmitted, how actions are synchronized, and how trust is formed within teams. Within the framework of Industry 5.0, communication is no longer a simple exchange of instructions, but a dynamic process of integration between **human presence** and **digital connectivity**.

This transformation can be summarized through three primary levels of communication integration (Figure 1.7).

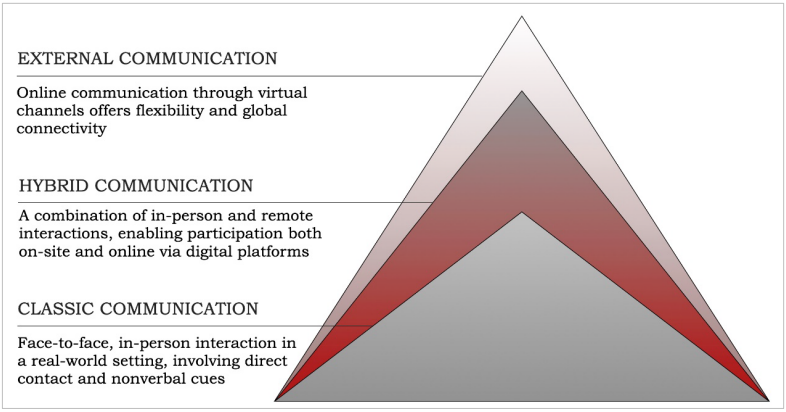

Figure 1. 7 Levels of Communication Integration in Maritime and Inland Waterway Transport

The three levels reflect the transition from classical human-centered communication to digitally enriched interaction. While traditional communication is grounded in trust and emotional connection, the hybrid environment of Industry 5.0 requires a new capability-the ability to **build trust through technology**. This shift directly influences leadership, team dynamics, and organizational culture, positioning communication as a strategic factor for both effectiveness and safety.

A substantial portion of daily interactions in the maritime sector-management processes, team coordination, customer service, negotiations, and inspections-still occurs face to face. In these settings, soft skills play a decisive role: active listening, empathy, sensitivity to nonverbal cues, assertiveness, and the ability to communicate clearly and respectfully. These competencies shape the culture of professional conduct and form the foundation of business communication-a strategic resource in maritime and inland waterway transport that directly influences service quality, operational safety, and the sector's public reputation.

Business communication performs a dual function:

• **Operational**-enabling the exchange of information, coordination of actions, and timely decision-making;

• **Reputational**-shaping professional credibility, customer culture, and leadership style.

Within this framework, human presence cannot be replaced by algorithms. It provides **emotional authenticity**-the capacity to create genuine connection with partners, clients,

and team members. As Maxwell (2023) emphasizes, the most powerful form of communication is achieved when a message reaches not only the listener's mind but also the heart-an essential principle in maritime professional culture, where trust, coordination, and effective leadership are critical.

Thus, the contemporary professional in the shipping sector must combine logical reasoning, ethical judgment, and emotional intelligence. Key competencies include:

- *Clear and adaptive communication*
- *Negotiation and diplomatic skills*
- *Presentation and persuasion abilities*
- *Cultural and linguistic flexibility*
- *Emotional intelligence*
- *Conflict and stress management*
- *Coaching and facilitation skills*
- *Ethical leadership*
- *Systems thinking and strategic perspective*
- *Sustainability-oriented thinking*

In reality, the primary challenge is not the technology itself, but the **uneven development of soft skills among team members**. Cultural, generational, and communicative differences can become sources of both creativity and tension. For this reason, leaders increasingly assume the role of psychological mediators, responsible for cultivating trust, transparency, and emotional awareness within teams.

The emerging professional landscape requires not only communication but **co-creation**. Technologies no longer merely transmit information; they create platforms for **collective intelligence**, enabling specialists from different departments, vessels, or locations to collaborate in real time. This fundamentally transforms the nature of communication-from a process of data exchange to one of **shared thinking, joint problem-solving, and mutual learning**.

In this transformed environment, cognitive and emotional soft skills-analytical capacity, adaptability, creativity, and initiative-become the cornerstones of professional resilience.

1.2.3. The Role of Soft Skills in Organizational Effectiveness

In the context of organizations in maritime and inland waterway transport-whether shipping companies, logistics operators, port authorities, or cruise lines-soft skills serve as a **social adhesive**, binding individual units into a shared culture of effectiveness. Traditionally, effectiveness has been associated with goal achievement, rational resource allocation, and economic return. In the maritime industry, however, it also carries a distinctive **social dimension**, as it depends on synchrony between people, the emotional climate within teams, and the prevailing communication culture.

Here, soft skills act as a **social regulator**-they maintain the balance between formal structures and human relationships. Skills such as active listening, clear self-expression, ethical judgment, empathy, and trust-building reduce conflict and foster psychological safety. Within such an environment, teams become more open to innovation, more agile in periods of change, and more resilient during crises.

Contemporary research in organizational psychology confirms that soft skills are strong predictors of effectiveness-not only at the individual level, but also at the team and

organizational levels. According to Colledani, Robusto, and Anselmi (2024), organizations that systematically invest in the development of non-technical competencies achieve higher levels of trust, engagement, and creativity-resulting in measurable improvements in productivity and innovation.

The cultivation of soft skills also transforms the professional identity within the maritime sector. The modern specialist is no longer an "executor," but an active participant in **collective intelligence**-a dynamic environment where information flows freely, and decisions are co-created in real time. When organizations foster self-reflection, creativity, critical thinking, and collaborative skills, they develop an internal **ecosystem of growth**. This ecosystem directly influences innovation, safety, and customer satisfaction-the three central pillars of organizational effectiveness in maritime and inland waterway transport.

Organizations that treat soft skills development as a **strategic process** build resilient cultures of learning and engagement. This often includes leadership development initiatives, coaching and mentoring programs, emotional intelligence training, and simulations of communication scenarios. In logistics and port organizations-where teams are multidisciplinary-such initiatives enhance interdepartmental understanding, accelerate crisis response, and strengthen customer loyalty. In this way, soft skills become a form of **organizational immunity**-a protective layer against stress, isolation, and communication breakdowns.

This trend is reinforced by the findings of Autsadee et al. (2025), who observe that in the maritime and inland waterway transport sector, success is increasingly measured not only through economic indicators but through the **human engagement index**-a new metric of effectiveness in the era of Industry 5.0.

Thus, soft skills are not merely an accessory to technical expertise-they constitute the **intellectual infrastructure** upon which organizational resilience is built. When individuals possess communicative clarity, emotional awareness, and creative thinking, they contribute to the development of a living organization-one that learns, adapts, and evolves.

The table illustrates how different categories of soft skills reinforce the key dimensions of organizational effectiveness-from operational and innovative to socio-psychological and strategic. These interconnections demonstrate that the human factor is not merely a resource but an **active architect of organizational resilience**.

Leaders play a central role in this process, shaping organizational culture through behaviors grounded in empathy, trust, and ethical conduct. Their abilities in facilitation, coaching, and fostering psychological safety determine the extent to which organizations can translate the human-centric principles of Industry 5.0 into practical managerial reality.

Thus, a clear conceptual link emerges between the development of soft skills and the rise of a **new type of leadership-human-centric, facilitative, and collaboration-oriented**. This emerging leadership paradigm will be explored in detail in the next section.

Table 1. 3 Relationship Between Soft Skills and Dimensions of Organizational Effectiveness in Maritime and Inland Waterway Transport

(prepared by the author based on Demir et al., 2019; Breque, De Nul & Petridis, 2021)

Category of Skills	Function in the Organizational Context	Effectiveness Dimension	Manifestations in Water Transport
Communication Skills	Ensure clarity, coordination, and trust among units	**Operational effectiveness**	Improved coordination between shore-based and ship crews; rapid response to changes and emergency situations.
Cooperative and Collaborative Skills	Stimulate teamwork and shared decision-making	**Innovation effectiveness**	Development of joint solutions to logistical challenges; integration of ideas from different professional levels.
Leadership Skills	Motivate and guide teams toward shared goals	**Strategic effectiveness**	Supporting visionary management in times of technological and market changes; building organizational sustainability.
Emotional Skills	Support psychological stability and social harmony	**Socio-psychological effectiveness**	Building trust and psychological safety within teams; reducing tension during digital transformation.
Cultural and Social Intelligence	Facilitate communication between people of different national and professional backgrounds	**Intercultural effectiveness**	Improved communication in multicultural crews; higher levels of cooperation and customer satisfaction.
Ethical and Responsible Skills	Ensure moral, safe, and transparent governance	**Ethical and safety effectiveness**	Strengthened safety culture ("Just Culture"); transparency in decision-making and accountability.
Adaptive Skills	Support responses to technological and organizational changes	**Resilience and adaptability**	Successful handling of unforeseen situations; effective adaptation to new digital systems.
Meta-cognitive Skills	Support self-reflection and learning from experience	**Organizational learning**	Error analysis and application of lessons in future operations; improved procedures through feedback.
Collective Intelligence	Synergizes human and technological resources within the team	**Organizational synergy**	Coordinated decision-making between departments leading to higher efficiency and system sustainability.

1.3. Leadership and Organizational Culture in the Fifth Industrial Generation

Beneath the surface of every leadership theory, model, or framework lies a complex and demanding art-the art of influencing without causing harm, yet defending firmly when necessary; of guiding without suppressing, yet standing one's ground when the direction is clear; of inspiring without controlling, yet exercising control when the cost of error is too high.

Authentic leadership is a delicate equilibrium between strength and compassion, between discipline and trust. A leader is the one who opens a path where none previously existed-sometimes with gentleness, sometimes with firmness. To lead means to possess the courage to make difficult decisions: to put an end to hesitation, to demand excellence, to remain uncompromising toward mediocrity, and to command respect-respect that may, at times, carry a trace of fear, but never humiliation.

This is one of the most profound paradoxes: like leadership, a true leader is a union of opposites.

If "soft" leadership detaches itself from decisiveness,

It dissolves into toothless idealism.

If "hard" leadership forgets the human being,

It devolves into authoritarianism.

Leadership mastery lies in balancing these two forces.

Leadership is, above all, a **psychological process**-one that begins in the mind but is ultimately measured in the hearts of people. The leader is the *"emotional conductor of the organization"* (Goleman, 2021); their emotional tone sets the rhythm, tempo, and harmony of the team.

As Maxwell (2024) notes, authentic leadership follows *"the high road"*-the path of integrity, respect, and the capacity to unite people even when circumstances divide them. It is this moral clarity that allows the leader to serve as a steady compass in situations of pressure and uncertainty.

A leader is not only a coordinator of processes, but a **guardian of spirit**-the one who sustains belief when fatigue erodes motivation. Amid cultural differences and contrasting personalities, the leader transforms tension into understanding and shared purpose. They model composure when pressure intensifies and provide reassurance when direction seems uncertain. In the professional world-where risk and responsibility are daily realities, from the bridge and engine room to the office and cruise terminal-the leader serves as the moral center, turning uncertainty into trust and tension into strength.

Yet leadership extends beyond coordination and reassurance. The leader is also an **awakener**-someone who ignites in others the potential they may not yet recognize in themselves. This kind of leader does not rely on slogans; they kindle an inner spark.

They help people uncover their strengths and encourage them to grow. In doing so, the leader becomes a **teacher of meaning**-one who translates everyday tasks into the language of values and purpose.

The leader is also a **motivator**-not through promises, but through presence. When leaders genuinely believe in the mission, those around them begin to think as well. They motivate not merely through words, but through consistency, empathy, and the readiness to stand alongside their people. In times of difficulty, the leader does not ask *"Who is at fault?"* but rather *"What can we accomplish together?"*

And finally, the leader is an **educator**. They cultivate an environment where development, experimentation, and learning are not only permitted but encouraged. Instead of fearing people who are more knowledgeable or more initiative-driven, they empower them. In the maritime industry, this means mentoring younger colleagues, fostering knowledge transfer, and building a culture where sharing is viewed as a strength rather than a threat.

Thus, the leader becomes an **emotional catalyst for growth**-not merely a coordinator of work, but a steward of belonging, meaning, and development within the organization.

1.3.1. Leadership Theories and Styles in Maritime and Inland Waterway Transport

Leadership is perhaps the most inherently human of all organizational phenomena. It is not merely power, position, or managerial privilege, but a movement of meaning, energy, and mutual influence. In the maritime and inland waterway transport sector, leadership is the force that guides teams through the dynamics of change, uncertainty, and technological transformation.

Here, the leader is not a distant figure but a coordinator of human potential-a person who creates synchrony among people, systems, and cultures. Leadership in maritime and inland waterway transport is a process of trust and authenticity that begins inward, in one's attitude toward oneself, and unfolds outward, in one's attitude toward the team.

For decades, leadership was seen as a gift-a privilege reserved for exceptional individuals endowed with charisma, decisiveness, and above-average intellect (Bass, 1990). The early *"great man"* theories placed the leader on a pedestal: untouchable and nearly mythological. Yet modern science gradually shifts this perspective. Leadership is no longer understood as an inherent trait but as a dynamic repertoire of behaviors developed through interaction and experience (Lewin, Lippitt & White, 1939).

This reconceptualization has profound implications for organizations in maritime and river transport. In the dynamic and often unpredictable environment of the sea, ports, and logistics chains, leadership is not a function of position but of behavior. It emerges wherever an individual maintains composure, acts with integrity, and assumes responsibility-even without formal authority.

The captain who calms the crew during a storm.

the manager who protects their team before upper management;

the operator who guides a novice through their first mistakes-

Each of them demonstrates leadership.

With time, emphasis shifted, and leadership began to be perceived not as an inherited disposition but as a **developable capability** (Lewin, Lippitt & White, 1939). This shift is especially significant in maritime and inland waterway transport, where leadership often arises from the situation rather than the job description.

A true leader is not simply an authority figure but a **psychologist of context**. They understand that organizations are not mechanical structures but living systems that respond to emotion, ambiguity, and change.

Thus, leadership cannot be confined to a single style-it is a dynamic balance between firmness and flexibility, between reason and intuition (Yukl, 2020). The situational theories of Fiedler, Hersey, and Blanchard hold that effective leaders adapt to their environments. They read the "emotional climate" of the team as a navigator reads nautical charts-seeking the right course even when the horizon is shrouded in fog.

In the maritime transport sector, such adaptability is not an advantage but a necessity. Work unfolds under pressure, across diverse cultural frameworks, and in an era where human interaction is increasingly mediated by technology.

To lead in such an environment means being able to shift roles without losing authenticity-to be a firm coordinator when risk is high, and a patient listener when fear takes hold. To manage processes, but also to ease tension. To preserve humanity even as algorithms begin to dictate the rhythm of work.

In maritime and inland waterway transport organizations, leadership is also a form of **emotional plasticity**-the ability to sense the team's pulse and respond with wisdom rather than force. This is what separates the one who commands from the one who leads.

Gradually, leadership steps out of the shadow of command and reveals its true essence: **influence through inspiration, not fear**. Bass's transformational model reframes organizational behavior: the leader is no longer a supervisor who distributes tasks, but an inspirer who ignites meaning (Bass, 1990).

In maritime and inland waterway transport, this shift is apparent. Technologies can automate nearly everything-but not enthusiasm, moral commitment, or the human spark. A team is not motivated by instructions but by the feeling that they matter. For this reason, the modern leader is no longer above the people but **with** them-on the deck, in the office, in the conversations held after a long shift.

When the leader succeeds in connecting individual efforts to a collective vision, what emerges is not only productivity but also **deep, internal engagement**.

People do not work for someone-they work with someone.

Not because they are obligated, but because they are inspired to do so.

In cruise companies-where every day requires emotional presence, warmth, and professionalism under constant pressure-this type of leadership becomes the engine of psychological resilience. In port logistics, it appears as the ability to combine discipline with humanity-to demand high performance without ever compromising respect for the individual.

Actual influence does not come from command but from **presence**-from the way a leader speaks, listens, and restores calm when others begin to lose their footing. Such a leader does not merely manage processes; they inspire the belief that the storm can be navigated. In a world where position often speaks louder than voice, true authority belongs to the one who remains profoundly human.

The transformation from command-based to inspirational leadership is synthesized in Figure 1.8. The leadership models presented are deliberately selected to reflect the contemporary evolution of the leadership concept rather than to replicate traditional typologies in classical management psychology. The purpose of the analysis is not to catalogue all leadership styles, but to trace how leadership evolves-from a position of power to a **human process rooted in meaning, trust, and empathy**.

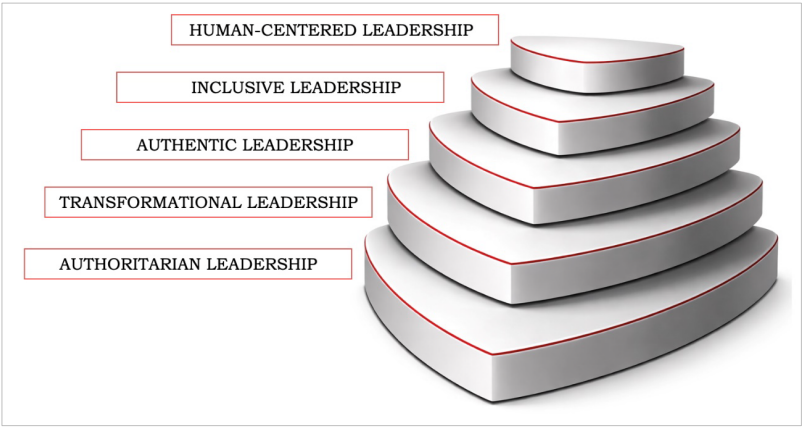

Figure 1. 8 Evolution of Leadership Models – From Authoritarian to Human-Centric Leadership

In its early stages, leadership was associated primarily with power and control. The authoritarian model-typical of early military and industrial organizations-emphasized discipline, obedience, and rigid Hierarchy (Lewin, Lippitt & White, 1939; Likert, 1961). The leader was perceived as the sole source of authority and decision-making, while the team functioned as an executor of orders (Bass, 1990). Although this model ensured efficiency in conditions of uncertainty and risk, it often stifled initiative and creativity-an effect that contributed to the gradual shift toward more flexible and human-centric approaches (Yukl, 2020; Northouse, 2021).

Contemporary theories of authentic leadership (Avolio & Gardner, 2005; Greenleaf, 1977; Luthans & Avolio, 2003; Northouse, 2021) move the focus away from positional power and toward the leader's personality. They emphasize ethics, self-awareness, emotional transparency, and the capacity to inspire through example rather than control.

In the maritime transport ecosystem, this form of leadership carries particular significance. There is little room for pretence-work is concrete, risk is tangible (Dimitrov, 2022), and trust is earned not through rhetoric but through consistent daily behavior. When a leader takes responsibility without seeking excuses, shields their team from

external pressures, and stands firmly behind their decisions, their authority becomes informal yet unshakable.

In the globalized environment of maritime and port operations-where the deck and the terminal serve as meeting points for diverse languages, cultures, and worldviews-**inclusive leadership** becomes not merely an approach but an operational necessity (Nembhard & Edmondson, 2006; Ferdman, 2020). A vessel, a port shift, a logistics operation-each functions as a miniature society, where effective management depends not on flawless procedures but on people's ability to understand one another across differences (Mor Barak, 2017).

The inclusive leader creates this connection. They act as a mediator between cultures, a psychologist, a translator of values. They must find a shared language between the Filipino seafarer and the Norwegian engineer, between the young cadet and the seasoned boatswain. This requires not only tolerance, but a high degree of cultural intelligence-the ability to adapt while remaining true to oneself.

As Ferdman (2020) notes, inclusive leadership is the capacity "to create a space in which everyone feels seen, heard, and valued." In maritime and inland waterway transport, this acquires heightened significance because intercultural cooperation is not simply a value-it is a daily operational reality (Shore et al., 2011; Prime & Salib, 2014). It is precisely this trust that transforms multicultural crews from a collection of individuals into a living organism that thinks, acts, and grows together.

Building on authenticity and inclusion, leadership now enters a new dimension-**the management of people within the digitalized reality of Industry 5.0**. In this context, the leader becomes a bridge between humans and technology, between algorithmic precision and moral judgment-transforming technological advancement into a profoundly human achievement.

1.3.2. Transformational and Human-Centric Leadership in the Era of Industry 5.0

In the fifth industrial paradigm, leadership is no longer assessed merely by the ability to introduce innovations or maintain efficiency, but by the capacity to **unite human energies and technological capabilities under a shared vision**.

For this reason, the present section focuses on two leadership models that most clearly articulate the direction of this evolution within the maritime and inland waterway transport sector-**transformational leadership** and **human-centric leadership**. Their selection is deliberate and grounded in solid scientific and conceptual logic. As demonstrated in the previous section, leadership has evolved from authoritarian and hierarchical structures toward models built on trust, empathy, and engagement. Within this progression, transformational leadership marks a decisive turning point: it introduces the idea of *inspiration* as a source of influence. It redefines the leader as a bearer of vision rather than a holder of authority.

Human-centric leadership, in turn, is the natural continuation of this development-a contemporary philosophy that places the human being at the core of the organizational system, even when that system is deeply technologized.

These two approaches do not simply complement one another-they **intertwine into a unified leadership paradigm for the future**. Transformational leadership provides direction, stimulates change, and sustains the team's innovative impulse. In contrast, human-centric leadership provides balance, care, and an ethical framework in which technological progress does not diminish human value but *enhances* it.

In the multicultural teams that characterize the maritime and port industries, the relationship between these leadership models and organizational culture is profound. Organizational culture is the invisible code that unites differences and sets the rhythm of collective work, while the leader is both its creator and guardian. As Hofstede (2010) famously states, *"organizational culture is the collective programming of the mind that distinguishes one organization from another."* Yet it is the leader who interprets and reprograms these differences into a shared system of values. In contexts of cultural diversity, the leader becomes a **translator of meaning**-a person who builds a common language of respect, trust, and belonging.

The adaptation of organizational culture is shaped not only by internal values and management models but also by broader economic and geopolitical forces that define the maritime sector's strategic environment. As Yotsov (2023) points out, global rivalries and economic tensions create a climate of perpetual uncertainty, necessitating organizational flexibility, resilience, and high technological readiness.

Contemporary research reinforces these observations. Sacavém et al. (2025) highlight transformational leadership as a critical factor for successful digital integration and organizational adaptability. Pratiwi et al. (2025) and Lepeley et al. (2021) develop the concept of human-centric leadership as an essential corrective to technological expansion, while recent analyses from Harvard Business Impact (2024) emphasize empathy, ethics, and innovative thinking as key leadership competencies in the digital era.

Thus, the decision to examine these two models is both historically grounded and highly relevant. They represent the apex of the evolutionary trajectory outlined earlier and most accurately reflect the spirit of our time-a time in which leadership must unite **artificial intelligence and human wisdom, algorithms and compassion, efficiency and meaning**.

TRANSFORMATIONAL LEADERSHIP PROVIDES THE VISION FOR THE FUTURE, WHILE HUMAN-CENTRIC LEADERSHIP ENSURES THAT THIS FUTURE REMAINS HUMAN.

The leader is the architect of the environment in which people and technologies learn and operate together. As Sacavém et al. (2025) emphasize, *"effective leadership is essential for integrating technologies into organizational processes and for fostering innovation."*

The digital era in the maritime domain requires leaders who understand not only technological infrastructures, but also the **emotional and ethical dimensions of change**-empathy, adaptability, and resilience. In maritime logistics and inland waterway transport, this means guiding teams through new interfaces, autonomous vessels, and digital operational platforms while preserving human connection. In the human–digital paradigm, empathy and flexibility are among the most essential leadership capabilities.

Therefore, effective leadership must cultivate a **culture of digital collaboration**-an environment in which people feel confident to participate, share ideas, make mistakes, and learn. Without such a collaborative culture, technologies risk becoming barriers rather than bridges.

Contemporary research identifies four core domains of competence (Figure 1.9) that constitute the foundation of effective leadership in a digital environment:

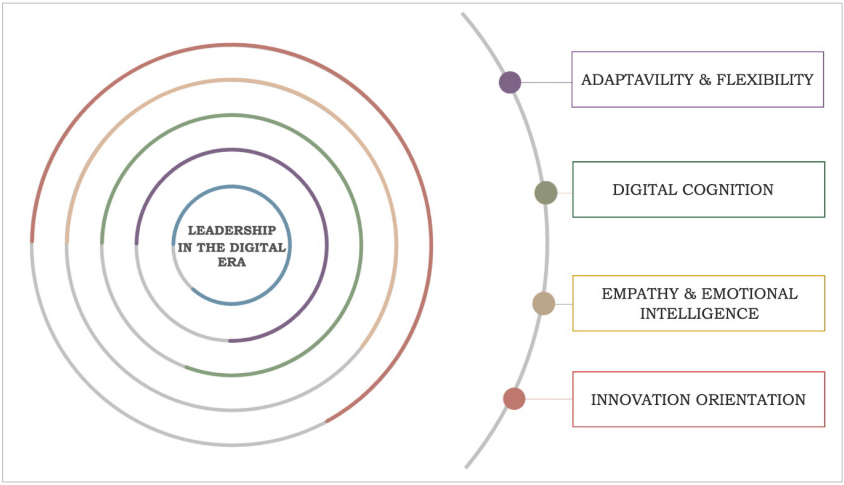

Figure 1. 9 Key Leadership Competencies in the Digital Era

• Adaptability and Flexibility

This refers to the leader's capacity to respond swiftly and appropriately within a constantly changing environment. Adaptability is one of the strongest predictors of digital readiness, as it ensures resilience in the face of situational or organizational disruptions in a maritime context. It encompasses the ability to manage real-time operations, respond efficiently to system failures, and maintain stability in the face of uncertainty.

• Empathy and Emotional Intelligence

A leader must understand not only the technological systems, but also the people who operate them. As Goleman (2021) describes, emotional intelligence is the *"quiet capital"* that sustains team resilience. It enables leaders to detect tension early, preserve psychological safety, and cultivate trust within multicultural and multidisciplinary teams.

• Digital Cognition

This competency requires more than technical literacy-it entails an understanding of algorithmic logic, data governance, and the ethical implications of artificial intelligence. It reflects the *cognitive agility* that distinguishes the strategic leader from the operational executor and forms the intellectual foundation of leadership in the digital era.

• Innovation Orientation

Innovation orientation refers to the willingness to experiment, take calculated risks, and engage in continuous learning. At its essence, the innovative mindset is fundamental to organizational adaptability and real-time learning. It transforms mistakes into opportunities for growth and establishes a culture of continuous improvement.

As succinctly summarized by Harvard Business Impact (2024):

"The leaders of the future must master a broader spectrum of behaviors-social and emotional intelligence, digital fluency, and data-driven skills."

It is precisely the combination of these competencies that shapes the profile of the **human-centric leader**-one capable of navigating successfully between technological progress and human value.

In this regard, the organizations of the future will be both technologically advanced and profoundly human-centered-a synthesis that fosters resilience, trust, and sustainable competitive advantage. Hariyani, Hariyani, and Mishra (2025) underscore this point, noting that *"leadership is essential for sustaining digital transformation initiatives."* Thus, it is the leader who ensures that every digital solution is meaningfully integrated with human processes, needs, and values.

For this reason, transformational and human-centric leadership should not be understood merely as leadership styles in the traditional sense, but rather as **ways of thinking and being in the** new industrial reality (Figure 1.10).

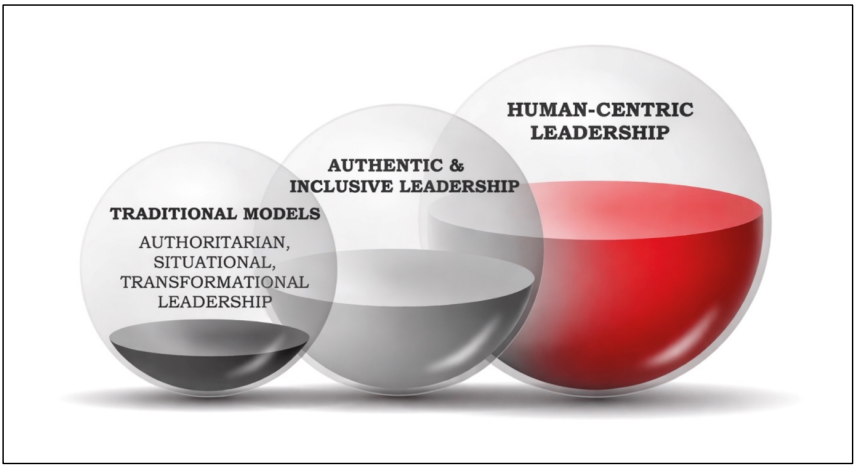

Figure 1. 10 Evolution of Leadership Approaches: From Authoritarian to Human-Centric Leadership in Maritime and Inland Waterway Transport

1.3.3. The Leader as a Carrier of Organizational Culture and Values in the New Industrial Ecosystem

After decades in which technological progress dominated development logic, the world is increasingly recognizing that efficiency without humanity is short-lived and fragile. As emphasized in the European Commission's report (Breque et al., 2021) and reinforced by subsequent studies (Sima et al., 2020; Bican & Brem, 2020; Brand et al., 2021), Industry 5.0 demands a new kind of leader-one who not only manages systems and processes, but also builds an organizational culture in which technologies serve people, rather than people serving technologies.

- **The Leader as a Culture Architect**

In every organization, culture is the invisible code that dictates *"how things are done."* It is not written in regulations, but lived through daily choices, relationships, and gestures.

The leader is the one who sets this code-the architect of behavior and meaning whose example defines the norms of interaction. As Sima et al. (2020) and Lepeley et al (2021) observe, leaders in Industry 5.0 act as cultivators of organizational values that foster sustainability, collective intelligence, and responsible innovative thinking.

In the maritime transport ecosystem, this role acquires particular significance, as modernization-autonomous ships, smart ports, digital twins-transforms not only operational processes but also how people think and construct their professional identity. The leader becomes a mediator between humans and technology, between the profession's heritage.

- **The Leader as a Facilitator of Trust**

Traditionally, organizations in maritime and inland waterway transport have operated within highly hierarchical structures-a legacy of maritime discipline and the responsibilities inherent to high-risk environments. Today, however, sustainable effectiveness requires **flatter structures and shared responsibility**. The leader is no longer the apex of the pyramid, but the center of a network-someone who connects people, stimulates communication, and encourages initiative.

Research by Bican and Brem (2020) shows that organizational cultures grounded in trust and participation are more innovative and resilient. In such environments, the leader acts as a **facilitator**-a creator of space for dialogue rather than monologue. Leadership in the new industrial era is not measured by control, but by the ability to inspire a culture in which people feel valued.

- **The Leader as an Ethical Compass**

At the heart of Industry 5.0 lies the concept of **ethical leadership**-leadership not as power, but as responsibility toward people and toward the future. Leaders shape organizational culture through moral choices: transparency, fairness, respect for human well-being, and stewardship of the environment. Spies (2025) notes that *"sustainable leaders in Industry 5.0 combine technological vision with moral courage."*

In the maritime sector, this means balancing economic performance with social responsibility-protecting labor rights, ensuring gender equality, safeguarding the marine

environment, and supporting local communities. A leader who cultivates a culture of ethics does more than motivate; they nurture a **sense of mission**.

- **The Leader as a Catalyst of Knowledge**

Industry 5.0 places strong emphasis on **co-creation**-the collaborative generation of knowledge. Organizations are no longer factories of instructions, but **ecosystems of learning**. Within this paradigm, the leader becomes a catalyst of collective intelligence, encouraging knowledge sharing, experimentation, and intrapreneurship. As Breque et al. (2021) emphasize, this represents *"a shift from organizational compliance to organizational collaboration."*

In maritime logistics, such leadership translates into a culture where ideas are welcomed regardless of rank and mistakes are recognized as opportunities for improvement. The leader does not simply manage tasks-they nurture a community that thinks, learns, and evolves together.

- **The Leader as a Cultural Bridge Between Generations**

Industry 5.0 is also a **generational dialogue**-between the experience of traditional maritime professionals and the digital intuition of younger talent. The leader's mission is to unite these two worlds and build a culture of continuity in which wisdom does not yield to technology but guides it. As Northouse (2024) observes, *"every sustainable organization has leaders who translate the past into the future."*

The modern leader is therefore not only a strategist, but a **bearer of culture**-of respect, meaning, and connection. They transform the organization from a mechanical structure into a living organism in which people experience belonging and purpose.

A true leader is not merely a figure of authority, but a **conduit of development**. They create a space where people want-and are enabled-to grow, experiment, and discover their professional and human identities.

This culture of inspired learning and shared responsibility leads naturally to the next dimension of organizational evolution: **education and competence development as drivers of sustainable behavior and long-term effectiveness**.

Conclusions from the Theoretical Chapter

The theoretical overview presented in this chapter reveals organizational behavior as a profound lens through which the human being within the organization can be understood-his choices, reactions, motivations, and inner pursuits in a world where technologies grow increasingly intelligent and values increasingly decisive.

In the maritime and inland waterway transport sector, this shift is felt with particular intensity. In the era of Industry 5.0, maritime and inland waterway professions become a stage for a new type of interaction-between humans and technologies, between individuals within multicultural teams, and between the human and the organization itself.

As emphasized by Schein (2017), Breque et al. (2021), and Carayannis & Morawska-Jancelewicz (2022), organizational behavior cannot be understood outside the ethical, cultural, and cognitive context of the human being operating within the system.

The conclusions of this theoretical chapter may be synthesized into three overarching directions, which encapsulate the chapter's key thematic emphases and outline the conceptual, behavioral, and strategic dimensions of organizational behavior in the maritime and inland waterway transport sector.

I. Evolution and Conceptual Foundations of Organizational Behavior in the Maritime Industry

• Organizational behavior has evolved from a mechanistic toward a humanistic model, in which the individual is not merely a resource but an active bearer of meaning, values, and innovation.

• In the context of Industry 5.0, organizational behavior acquires an interdisciplinary character, integrating psychology, sociology, technology, and ethics into a unified analytical framework.

• In the maritime industry, behavior is shaped through the interaction of three systemic levels-individual, team, and organization-within an environment defined by high technological dependence and cultural diversity.

• The human factor remains the strategic core of safety and efficiency, as it is through the human element that technological transformation gains ethical, social, and cultural depth.

At the individual level, the human being is no longer a cog in the system but its compass. Soft skills-empathy, communication, adaptability, cultural intelligence-emerge as the proper *navigation tools* in the digital ocean.

II. Soft Skills, Human–Technology Interaction, and Organizational Culture

• Human–technology interaction in the era of Industry 5.0 requires a new spectrum of competencies-cognitive, emotional, and creative skills that enable the effective integration of human reasoning with artificial intelligence.

• Soft skills-communication, emotional intelligence, adaptability, critical thinking, leadership-become a strategic determinant of organizational effectiveness, safety, and innovation.

• A human-centered design of the work environment and a culture of "fairness and learning" form the foundation for collective intelligence and for meaningful synergy between humans and technologies.

• Multicultural teams require a high level of cultural intelligence and empathy, which foster trust, coordination, and shared understanding in contexts shaped by geographical dispersion and digital communication.

Psychological safety becomes the new discipline of the future-a space where individuals can think openly, question assumptions, and experiment without fear of making mistakes.

At the organizational level, culture emerges as the heart of transformation-a living environment that breathes, learns, and evolves together with its people.

III. Leadership, Education, and the Strategic Development of Human Capital

- **Leadership in the era of humanized technologies is shifting from a directive model to a transformational and human-centric one**-the leader becomes a facilitator, mentor, and mediator between people and technologies.
- **Organizational culture emerges as a primary instrument of resilience**, nurturing innovation, trust, and continuous learning.
- **Education and professional training in the maritime industry must integrate soft skills and leadership development** as core components of human capital strategy.
- **A culture of learning and open leadership mutually reinforce one another**, creating an organizational environment in which knowledge is not merely transmitted but collectively created.
- **Within this context, leadership is not an expression of power but of balance.** The true leader no longer "commands" but connects and inspires-people, ideas, and values. Education becomes the quiet force behind this transformation-a process of awakening that shapes individuals with a moral compass and emotional maturity.

In conclusion, the theoretical analysis outlines a **new paradigm of sustainability**-one in which the human factor is not at the periphery of the industrial process, but its moral and intellectual core. This paradigm transforms not only how we understand organizations, but how we envision and build the future of the maritime industry.

CHAPTER II
METHODOLOGY AND RESEARCH APPROACH

The philosophy of the present study rests on the understanding that scientific knowledge is not merely the accumulation of data, but a process of moving beyond surface manifestations to uncover the deeper mechanisms and patterns that shape phenomena.

At its foundation stands the pragmatic philosophical tradition, which holds that the validity of knowledge is measured by its **practical applicability** and its capacity to guide meaningful action in the real world (Creswell, 2023; Bryman, 2015; Flick, 2018). Unlike positivism, which seeks universal and strictly objective regularities, pragmatism views knowledge as a **tool for action**, social transformation, and the enrichment of human experience (Saunders, Lewis & Thornhill, 2019).

Within this paradigm, methodology is not seen as a purely technical set of procedures, but as an **intellectual framework**-a way of thinking through which the researcher organizes, interprets, and translates reality into scientific language.

2.1. Philosophical and Methodological Foundations of the Study

From a philosophical standpoint, this work is positioned within the **humanistic paradigm**, which places the human being at the center of technological and organizational evolution. This perspective directs attention toward essential human factors-leadership, organizational culture, soft skills, and education-that shape the capacity of the maritime and inland waterway transport sector to adapt to the new industrial era.

Methodology therefore assumes particular significance, as its purpose is not merely to confirm or reject hypotheses, but to reveal **how and to what extent human factors influence the direction and pace of adaptation**. In this way, the study moves beyond narrow empiricism and seeks deeper analytical insight into the interplay between people, structures, and technologies.

The adopted **integrative approach** combines humanistic philosophy with pragmatic scientific methodology, forming a coherent framework for human-centered inquiry. This approach allows the application of both quantitative and qualitative methods, thus uncovering not only objective regularities but also subjective meanings and lived

experiences (Denzin & Lincoln, 2021). Such integration is especially appropriate for research conducted at the crossroads of technological and social systems-a defining characteristic of the maritime and inland waterway transport sector in its transition toward Industry 5.0.

Thus, the study is situated within the field of **applied humanism**, where data serve not only for interpretation but also for the transformation of practice. The integrative approach enables the development of human-centered policies and innovative organizational solutions aligned with the values of the new industrial paradigm. This philosophical and methodological foundation establishes the logic and structure of the research, which are further elaborated in the following subsection.

2.1.1. Integrative Logic of the Study and Expected Relationships

The logic of the study is grounded in a set of interconnected relationships that reflect the **systemic nature of the human factor** in the maritime and inland waterway transport sector. Its influence is conceptualized as a chain effect:

individual competencies → shape team dynamics → form organizational culture → translate into educational and developmental practices.

In this way, the study constructs an **integrative model of organizational behaviour**-one in which technologies serve the human being, rather than the human being serving technology.

- **Expected Relationships**

Based on the formulated hypotheses and the empirical results presented in the study, the human factor is expected to generate a coherent system of mutually reinforcing relationships. Leadership, soft skills, team dynamics, organizational culture, and modern educational preparation are assumed to function as **interdependent elements** within an integrated model of human-centric adaptation to Industry 5.0.

1. Individual Level

It is anticipated that professionals who cultivate social intelligence, emotional resilience, readiness for continuous learning, and confidence in working with technologies will demonstrate **higher professional effectiveness** and **greater adaptability** to the emerging requirements of the industrial environment. Individual competencies are viewed as a **primary driver**-a foundation that supports both personal growth and the ability of teams to function harmoniously and effectively.

2. Team Level

Teams that cultivate trust, open communication, and constructive approaches to conflict resolution are expected to demonstrate **higher levels of coordination, operational safety, and resilience**. Such team dynamics function as a crucial **linking mechanism** between individual abilities and collective effectiveness, creating the conditions for stable performance within the multicultural environments characteristic of the maritime and inland waterway transport sector.

3. Organizational Level

Organizations that foster a culture of learning, shared values, leadership support, and openness to innovation are expected to be **better prepared for the transition toward Industry 5.0**. Such cultures strengthen interpersonal relations, facilitate the integration of new technological and organizational solutions, and reinforce operational resilience. Within this environment, organizational culture acts as a **stabilizing force** that transforms individual and team efforts into sustainable organizational development.

4. Educational and Developmental Level

The integration of leadership, organizational behaviour, and intercultural competence into educational programmes is assumed to stimulate the development of **human-centric leadership, strategic thinking, and socio-ethical maturity**. Professionals trained within such frameworks are expected to demonstrate greater readiness to operate in technologically advanced and multicultural settings and to contribute actively to positive organizational dynamics.

5. Cumulative and Integrative Effect

The interaction among these levels is expected to produce a **coherent chain of positive influence**:

- Individual competencies support team effectiveness and internal coordination.
- Effective, trust-based teams contribute to the development of a resilient organizational culture.
- A resilient culture fosters innovation, learning, and long-term development.
- Modern educational practices ensure the reproduction and enhancement of these processes in future generations of professionals.

In this way, the human factor is expected to emerge as a **key driver of technological adaptation, innovation, and sustainable development** in the maritime and inland waterway transport sector. The systemic nature of these interrelationships forms an **integrative model of human-centric transformation**, supported by the empirical analysis and serving as the theoretical framework of the study.

Table 2. 1 Expected Effect Strength and Predicted Values of the Key Domains

Hypothesis	Domain	Expected Results	Expected Estimate
H_0	Integrated human factor (individual, team, organizational, and educational level)	The integrated model is expected to demonstrate strong explanatory power, with the human factor emerging as a key predictor of adaptation toward Industry 5.0	High integrated model strength is expected (strong generalizing effect)
H_1	Individual skills	A moderate to strong effect of social intelligence, emotional resilience, and readiness to learn on professional effectiveness and adaptation to Industry 5.0 is expected	Moderately high values (β ≈ 0.40–0.55)
H_2	Team communication and trust	A stable positive influence on coordination, safety, and resilience in a multicultural environment is expected	Medium to moderately high values (β ≈ 0.30–0.45)
H_3	Learning culture and organizational sustainability	A strong effect is anticipated, as organizational culture is a key integrator of individual and team efforts	High values (β ≈ 0.50–0.65)
H_4	Education and professional development	A moderate influence is expected on readiness to work in a technologically enhanced environment and on long-term organizational development	Moderate values (β ≈ 0.15–0.30 for general effects; β ≈ 0.45–0.55 for internal dependencies)

2.1.2. Research Objectives, Hypotheses, and Research Questions

The present study seeks to reveal and scientifically substantiate the role of the **human factor as a strategic resource** in the adaptation of the maritime and inland waterway transport sector to the requirements of Industry 5.0. Its purpose is to identify the balance between technological transformation and the humanization of the organizational environment-an environment in which leadership, soft skills, culture, and education become key determinants of sustainable development.

- **Main Objective**

To develop an **integrative model of organizational behaviour in maritime and inland waterway transport** that reflects the interconnections among individual competencies, team dynamics, organizational culture, and educational preparation within the human-centric paradigm of Industry 5.0.

- **Specific Objectives**

1. **To identify and analyse key leadership and soft skills** that determine professional effectiveness and the adaptive capacity of specialists in the maritime and inland waterway transport sector in the context of Industry 5.0.
2. **To examine the influence of communication, trust, and conflict management** on team effectiveness within multicultural work teams.
3. **To assess the role of an organizational culture oriented toward learning, innovation, and sustainability** as a prerequisite for a successful transition to Industry 5.0.

4. **To investigate the impact of educational institutions** on the development of leadership and socio-emotional competencies among future professionals in the maritime and inland waterway transport sector.
5. **To develop practical guidelines and recommendations** for improving training programmes and organizational practices in maritime and inland waterway transport, aimed at strengthening human capital in the era of Industry 5.0.

▪ Research Hypotheses

The study is grounded in the understanding that the technological evolution characteristic of Industry 5.0 transforms not only the tools of work but also the very logic of organizational behavior. The human factor, manifested through leadership, soft skills, culture, and values, becomes a key driver of adaptation, effectiveness, and sustainability. On this basis, the following research hypotheses are formulated:

▪ Main Hypothesis (H_0)

> *The degree of adaptation of the maritime and inland waterway transport sector to Industry 5.0 is determined by the human factor, expressed through key competencies, leadership abilities, a learning-oriented organizational culture, and contemporary educational preparation.*

Expected Outcome: Organizations in the maritime and inland waterway transport sector that place the human being at the centre of their transformation-through the development of individual competencies, supportive leadership, effective team communication, and modern educational practices-are expected to transition more successfully toward the models of Industry 5.0.

When the human factor is treated as a primary strategic resource, organizations demonstrate **higher adaptability, resilience, and capacity to navigate change** in the Fifth Industrial Revolution. Thus, the human-centric approach becomes a key driver of **innovation, safety, and long-term development** in the sector.

▪ Sub-Hypotheses

(H_1) Individual Level

The leadership and soft skills of professionals in the maritime and inland waterway transport sector have a significant impact on their professional effectiveness, adaptability, and resilience in a technologically and socially dynamic environment.

> **Expected outcome:**
>
> Specialists with well-developed social intelligence, emotional resilience, and readiness to adopt new technologies are expected to demonstrate **higher professional effectiveness** and **greater flexibility** when working in an increasingly digitalized and dynamic environment. Individuals who exhibit strong empathy, communication skills, and self-regulation adapt more easily to new organizational demands and contribute more actively to the successful implementation of Industry 5.0 principles.

(H_2) Team Level

The effectiveness of multicultural teams in maritime and inland waterway transport depends on the application of leadership and soft skills in communication, trust-building, and conflict management.

> **Expected outcome:**
>
> Teams characterized by trust, transparent communication, and skillful management of interpersonal differences achieve **higher levels of coordination, safety, and productivity**. When team members experience support, respect, and psychological safety, they perform more effectively in multicultural environments and adapt more readily to innovations in daily operational processes.

(H_3) Organizational Level

An organizational culture oriented toward learning, innovation, and support is a decisive factor for the successful transition of maritime and inland waterway transport organizations to Industry 5.0.

> **Expected outcome:**
>
> Organizations that cultivate a culture of learning, mutual support, and openness to innovation transition more successfully toward Industry 5.0. In environments that encourage employee development and promote shared values and collective responsibility, professionals demonstrate **greater engagement**, establish **sustainable work practices**, and reinforce **organizational resilience**.

(H_4) Educational Level

The modernization of educational programmes in maritime and inland waterway transport-through curriculum innovations and the integration of leadership, organizational-behavioural, and intercultural components-has a significant positive impact on the leadership readiness of future professionals in the context of Industry 5.0.

> **Expected outcome:**
>
> Educational programmes that incorporate innovative content, leadership development, organizational-behavioural insights, and intercultural competence foster the growth of future leaders with **broad vision**, **strategic thinking**, and **readiness to operate in a smart and human-centric industrial environment**. Students trained through modern instructional methods develop greater confidence in team management, decision-making, and adaptation to technological change.

Research Questions

The research questions are formulated in alignment with the four-level model of the study and serve as conceptual "umbrellas" under which individual survey items collect empirical data. They provide a logical connection between the theoretical framework and the empirical analysis.

I. Individual Level (H_1)

Focus: Leadership and soft skills, professional effectiveness, and adaptation to Industry 5.0

1. **To what extent do leadership and soft skills**-including communication, adaptability, emotional intelligence, and technological competence-**influence the professional effectiveness** of personnel in the maritime and inland waterway transport sector?
2. **How does the perceived importance of technical and soft skills** shape professional motivation and readiness to embrace organizational and technological change?
3. **To what degree do individual adaptability and stress resilience** support successful integration into a digital and rapidly evolving work environment?
4. **How does an individual's perceived preparedness for Industry 5.0** influence their professional confidence, performance, and openness to innovation?

II. Team Level (H_2)

Focus: Communication, trust, conflict management, and effectiveness in multicultural environments

1. **How does cultural diversity** affect communication, coordination, and overall team effectiveness within the maritime and inland waterway transport sector?
2. **How do mutual trust and the quality of leadership** influence a team's ability to address and resolve conflicts constructively?
3. **To what extent does a supportive and respectful team climate** enhance motivation, psychological safety, and operational efficiency?
4. **What is the impact of multicultural competence** on team dynamics, coordination, and the long-term sustainability of team performance?

III. Organizational Level (H_3)

Focus: Learning culture, innovation, and sustainability

1. **How does a culture of learning and innovation influence organizational adaptation** to the principles of Industry 5.0?
2. **To what extent do organizations in the maritime and inland waterway transport sector encourage collaboration, knowledge sharing, and innovative thinking** as sources of sustainable development?
3. **How do leadership practices and organizational values** contribute to the formation of a sustainable, ethical, and human-centric organizational culture?
4. **To what extent does organizational culture function as a mediator** between individual competencies and collective effectiveness within maritime and inland waterway transport organizations?

IV. Educational and Developmental Level (H_4)

Focus: Modernization of maritime and inland waterway transport education and the development of human capital

1. **To what extent do educational programmes in maritime and inland waterway transport disciplines meet the requirements of Industry 5.0?**

2. **How does the integration of courses on organizational behaviour, leadership, and intercultural competence** support the development of human-centred leaders?
3. **What are the needs of professionals** for updated, interdisciplinary, and integrated educational programmes aligned with the demands of Industry 5.0?
4. **How does effective partnership between universities and the maritime industry** contribute to the development of future leadership readiness and professional competence?
5. **To what extent do modernized educational programmes enhance the adaptability and resilience** of personnel in the maritime and inland waterway transport sector?

V. Integrative Research Question (H_0)

To what extent does the human factor-manifested through leadership, soft skills, organizational culture, and education-determine the adaptation of the maritime and inland waterway transport sector to the principles and values of Industry 5.0?

2.1.3. Research Framework and Logic of Analysis

The study is grounded in a four-level analytical model that reflects the systemic logic of organizational behaviour and the interdependence between the human factor, organizational culture, and adaptation to technological transformation.

Individual → Team → Organization → Education

This model is intentionally structured so that each level builds upon and reinforces the previous one: from **individual competencies**, through **team dynamics**, to **organizational culture**, finally culminating in the **educational environment**, which shapes future generations of professionals.

Table 2. 2 Levels of Analysis and Corresponding Hypotheses in the Four-Level Model

Level	Focus of Analysis	Hypothesis
Individual	The impact of leadership and soft skills on effectiveness and adaptability	**(H_1)**
Team	The role of communication, trust, and conflict management in team effectiveness	**(H_2)**
Organizational	The influence of learning culture, innovation, and sustainability on the transformation toward Industry 5.0	**(H_3)**
Educational	The role of organizational behavior and leadership in the preparation of future maritime leaders	**(H_4)**

All these levels operate within the scope of **the main hypothesis (H_0).**

This structure ensures internal logical coherence, as each level provides the foundation and context for the next. The individual becomes part of the team; the team becomes a bearer of organizational culture; and the organization, in turn, becomes a generator of new educational and professional models.

In this way, the human factor emerges as the integrating axis that links individual competencies, collective behaviour, and organizational transformation. It functions simultaneously as a starting point and a unifying mechanism-connecting personal abilities with team dynamics, shaping cultural patterns, and supporting the broader adaptation of the maritime and inland waterway transport sector to the human-centric logic of Industry 5.0.

▪ Logical Sequence of the Analysis

The analysis progresses from micro-behavioural to macro-organizational processes. It begins at the **individual level**, examining how personal skills, attitudes, and leadership competencies shape professional effectiveness and adaptability.

The focus then expands to the **team level**, where interpersonal interactions generate either synergy or tension.

At the next stage, attention shifts to **organizational culture**, which provides the structural and value-based framework for sustainability, innovation, and long-term development.

Finally, the analysis reaches the **educational environment**-the sphere in which future models of leadership, ethics, and human-centred management are cultivated.

This logic is not merely methodological, but also philosophical: a progression from the person to the system, from experience to vision, from today's knowledge to tomorrow's competence.

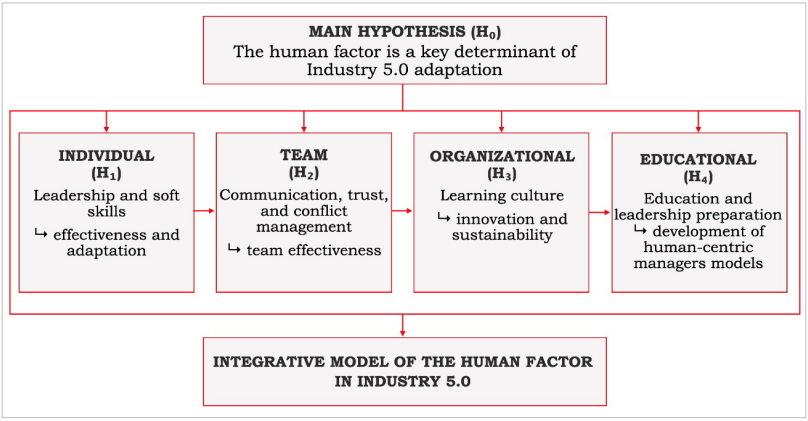

Figure 2. 1 Relationship Between the Analytical Levels and the Main Hypothesis (H_0)

The model illustrates the interrelation between the different analytical levels and their contribution to validating the main hypothesis (H_0).

- **At the individual level (H_1)**, the analysis explores how leadership abilities and soft skills influence professional effectiveness and adaptability.
- **At the team level (H_2)**, communication, trust, and conflict management are examined as key determinants of team coordination and overall effectiveness.
- **At the organizational level (H_3)**, the emphasis is placed on the culture of learning, innovation, and sustainability as drivers of long-term development.
- **At the educational level (H_4)**, the study investigates the role of education and leadership preparation in shaping human-centred management models suitable for the Industry 5.0 era.

These levels do not function in isolation; they interact dynamically and form a coherent structure-a unified **Integrated Empirical Model of the Human Factor in Industry 5.0** (Integrated Human Factor Model for Industry 5.0 Adaptation).

Within this model, organizational effectiveness and successful adaptation to Industry 5.0 emerge from the combined influence of competence, culture, and values-elements that collectively determine the human-centric evolution of the maritime and inland waterway transport sector.

2.2. Research Design and Methodological Instruments

The research design represents the architecture through which an idea is transformed into a verifiable scientific construct (Yin, 2017; Creswell & Creswell, 2023). It establishes the logical and empirical framework within which abstract notions-such as organizational behaviour, leadership, and soft skills-are translated into measurable variables and observable relationships.

The purpose of this design is not merely to test hypotheses, but to construct an integrated analytical system capable of revealing how the human factor operates within the

maritime and inland waterway transport sector. By tracing its manifestations across multiple levels-individual behaviour, team dynamics, organizational culture, and the educational environment-the study seeks to capture the full depth and complexity of human-centric adaptation to Industry 5.0.

2.2.1. Selected Methodology

The choice of methodology is determined by the dual nature of the research problem, which is at once social and technological. It combines quantitatively measurable indicators of effectiveness with qualitatively interpretable human factors (Tashakkori & Teddlie, 2020; Greene, 2007).

The study is grounded in the **paradigm of pragmatism**, which posits that no single method holds universal superiority; instead, the most appropriate methodological choice is the one that best addresses the research question (Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2020).

This integrative and pragmatic orientation is also aligned with contemporary research in logistics and transport, where methodological flexibility, analytical rigour, and a balance between quantitative and qualitative perspectives are essential for producing reliable and applicable scientific conclusions (Stefanova, 2022).

Within this framework, the **quantitative approach** serves as the primary methodological instrument. It enables the identification of statistically significant relationships between leadership, organizational culture, soft skills, and adaptation to Industry 5.0. The collected data are subsequently subjected to analytical interpretation that uncovers the social, organizational, and behavioural dimensions of the phenomena under investigation.

- **Quantitative Approach**

The study applies a **quantitative methodological approach**, which ensures empirical objectivity and enables the systematic measurement of relationships between the key factors of organizational behaviour in the maritime and inland waterway transport sector. Quantitative analysis makes it possible to identify statistically supported patterns linking leadership, soft skills, organizational culture, and effectiveness in the context of the transition toward Industry 5.0 (Creswell & Plano Clark, 2023; Morgan, 2014).

The quantitative component involves administering a **structured survey** among professionals and leaders in the maritime sector. Through this instrument, data are collected on the core variables under investigation: leadership skills, soft skills, team effectiveness, organizational culture, and educational attitudes. The results are analyzed using statistical techniques-including correlation analysis, multiple linear regression, and diagnostic model tests-which ensures a high level of reliability, validity, and analytical robustness.

This quantitative framework is complemented by a **qualitative analytical interpretation**-a deeper conceptual reading of the statistical results within the broader social and organizational context. Importantly, this analytical layer does not constitute a separate qualitative data collection method (such as interviews or case studies). Instead,

it represents a qualitative interpretation of quantitative findings, enabling a richer understanding of the underlying meanings, leadership dynamics, and cultural mechanisms that characterize the human factor.

Through this synthesis, the study achieves a balance between **statistical precision** and **interpretative depth**, reinforcing the conclusion that human competencies and organizational culture play a decisive role in facilitating the sector's adaptation to the Industry 5.0 paradigm.

2.2.2. Operationalization of the Research Hypotheses

Operationalization is the process through which abstract concepts and theoretical hypotheses are translated into concrete, measurable variables and indicators. In the context of this study, operationalization forms the essential link between the research questions, the empirical data, and the analytical methods used to test the hypothesized relationships.

Its purpose is to ensure **logical coherence** between the theoretical model and its empirical implementation, as well as to secure the **reliability** and **validity** of the measurement of the human factor in the maritime and inland waterway transport sector.

The operationalization of the research constructs is implemented through a structured survey questionnaire (**Appendix 1**), covering all analytical levels of the study and designed to ensure internal consistency and reliability of measurement.

The following table presents a structured overview of the operationalization of the hypotheses across the four levels of the research framework-individual, team, organizational, and educational.

Table 2. 3 Operationalization of the Research Hypotheses

Hypothesis (Level)	Concept (Studied Factor)	Indicators (Empirical Manifestations)	Example Questionnaire Items (Illustrative)	Method of Analysis (Expected Relationship)
H_1 Individual Level	Leadership and soft skills as a factor for professional effectiveness and adaptation to Industry 5.0	• Communication skills • Adaptability • Emotional intelligence • Working with technologies • Self-assessment of effectiveness and stress resilience	• Items measuring adaptability to change and self-regulation • Items assessing emotional intelligence, self-awareness, and empathy • Items related to communication effectiveness and trust-building • Items capturing leadership initiative, motivation, and problem-solving capacity	**Correlation and regression analysis** between Soft Skills Index, Leadership Index, and Performance Index. **Expected relationship:** ↑ Soft skills and leadership → ↑ Effectiveness and adaptability
H_2 Team Level	Multicultural dynamics, trust, and leadership as predictors of team effectiveness	• Team communication • Conflict management • Mutual trust • Team cohesion and collaboration • Leadership fairness and motivation	• Items measuring openness, clarity, and respect in team communication • Items assessing mutual trust, psychological safety, and team cohesion • Items related to constructive conflict management and respectful disagreement • Items capturing shared responsibility, collaboration, and coordination under pressure	**Multiple linear regression** between Team Effectiveness Index and independent variables: Trust, Communication, and Conflict Management. **Expected relationship:** ↑ Trust + ↑ Communication → ↑ Effectiveness
H_3 Organizational Level	Organizational learning culture, innovation, and sustainability as a factor for adaptation to Industry 5.0	• Learning culture • Innovation practices • Ethical and shared values • Support for development and cooperation	• Items measuring the presence of a learning-oriented organizational culture • Items assessing support for innovation, knowledge sharing, and continuous improvement • Items related to ethical leadership, transparency, and shared organizational values • Items capturing the balance between technological advancement and human-centric principles	**Regression analysis** between the Organizational Culture Index and the Adaptation Index. **Expected relationship:** ↑ Learning culture → ↑ Organizational sustainability and adaptation
H_4 Educational & Development Level	Education aligned with Industry 5.0 and human capital development	• Alignment of curricula with Industry 5.0 requirements • Integration of soft skills and leadership skills • Development of digital and intercultural skills • University–industry collaboration • Need for additional training	• Items measuring alignment of educational programs with Industry 5.0 requirements • Items assessing integration of leadership, soft skills, and organizational behaviour in curricula • Items related to the development of social, emotional, and intercultural competencies • Items capturing the link between education and real industry needs and practices	**Correlation analysis** between the Education Modernization Index and the Adaptation Index. **Expected relationship:** ↑ Educational modernization → ↑ Adaptation and leadership readiness
H_0 General Hypothesis	The human factor as an integrating mechanism for adaptation to Industry 5.0	• Combined effect of individual, team, organizational, and educational variables	• Composite analysis of all indices	**Multiple regression ($R^2 > 0.80$).** **Expected relationship:** the human factor is the decisive predictor of adaptation to Industry 5.0

Each indicator corresponds to a set of items in the questionnaire (see Appendix 1), through which the respective latent variables are measured.

The operationalization of the hypotheses ensures methodological coherence and establishes a clear logical link between the theoretical assumptions and their empirical verification. It enables the identified relationships to be examined through quantitative analysis and provides a basis for assessing the influence of leadership, social, and organizational factors on adaptation to Industry 5.0.

In this way, the methodological framework forms a solid foundation for interpreting the results presented in the next chapter, where the actual relationships between leadership, soft skills, and organizational adaptability in the maritime and inland waterway transport sector are analysed.

2.2.3. Sample and Research Population

The present study includes specialists holding managerial and operational positions across the main subsectors of the maritime and inland waterway transport industry: cruise operations, shipping, maritime management, and logistics.

Throughout the research process, the author took advantage of the opportunity to survey participants during real work processes, in which he/she was directly involved through professional activities and research engagements in the respective countries. This approach ensures a high degree of authenticity in the data collection and allows for a deeper understanding of organizational dynamics, leadership practices, and professional culture within the sector.

The research population consists of specialists from different managerial levels and functional areas, reflecting the actual diversity of the maritime and inland waterway transport industry.

The empirical sample comprises **50 participants**, selected through a combined **stratified and purposive sampling approach**, with the aim of ensuring adequate representation of key professional categories and managerial levels in the sector (Saunders et al., 2019; Babbie, 2020).

This method provides balance and enhances the analytical reliability of the results.

- **Distribution of Participants by Sector**

Figure 1 presents the percentage distribution of participants according to the sector in which they are employed.

The largest share belongs to the **cruise sector (32%)**, followed by **water transport management (28%)**, while **shipping (20%)** and **logistics (20%)** represent equal proportions.

The diagram illustrates a well-balanced sample that encompasses all major areas of the maritime industry and related logistics activities, reflecting the real structure and diversity of the professional environment within the sector.

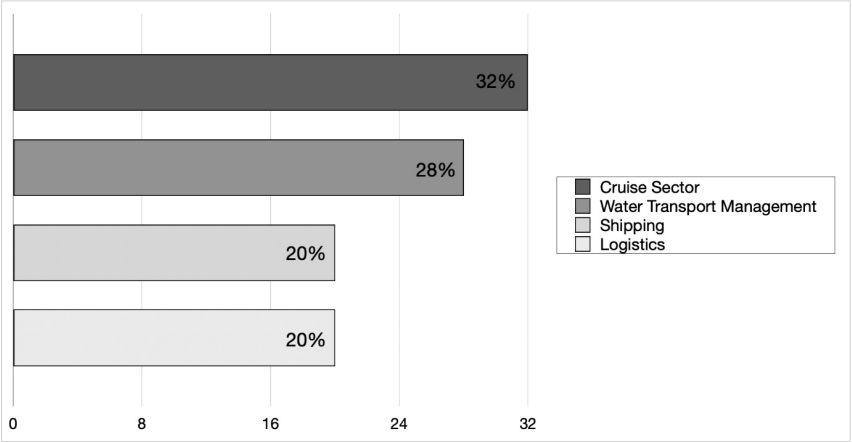

Figure 2. 2 Distribution of Participants by Sector

- **Distribution by Position in the Sector**

Figure 2.2 presents the percentage distribution of participants according to their positions within the sector.

The largest share consists of representatives in **management and coordination roles (40%)**, followed by **operational and administrative personnel (26%)**, and **officers and command staff (24%)**.

The smallest group comprises **lecturers and trainers (10%)**.

This distribution demonstrates a balanced sample that includes all key professional categories within the maritime and logistics industry, while maintaining a realistic predominance of management roles.

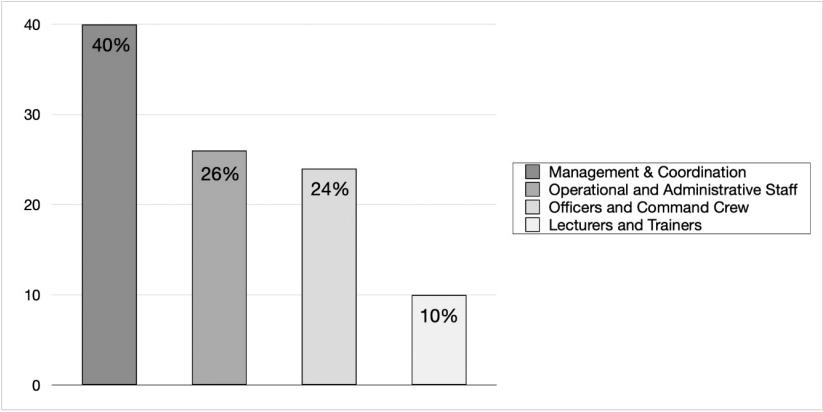

Figure 2. 3 Percentage Distribution of Participants by Position

▪ Professional Experience of Participants

Figure 3 illustrates the distribution of participants according to their professional experience in the maritime industry.

The **average professional experience is 13.16 years**, indicating a high level of expertise and accumulated organizational knowledge.

Such depth of experience increases the reliability of the empirical data, particularly in areas related to leadership, adaptability, and organizational culture (Field, 2018; Pallant, 2020).

The range of experience spans from **4 to 37 years**, with a **median of 12 years**.

These values indicate a well-balanced sample that includes both seasoned professionals and representatives of the younger generation entering the sector.

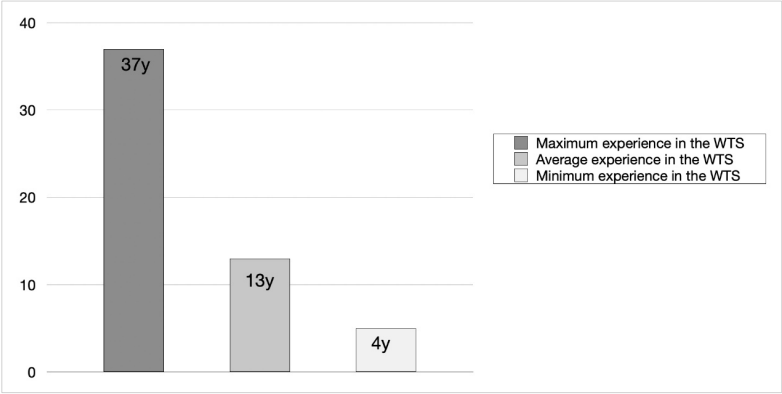

Figure 2. 4 Distribution of Participants by Professional Experience

▪ Experience in a Multicultural Environment

Figure 2.4 presents the distribution of participants based on their professional experience in multicultural teams.

The **average experience is 13 years**, reflecting a high level of intercultural competence and the ability to work effectively in diverse environments.

This strengthens the study's reliability, especially in sections concerning communication, leadership, and team dynamics in international contexts (Field, 2018; Pallant, 2020).

The range of multicultural experience varies between **4 and 37 years**, with the median closely aligned with the average value.

These data indicate a balanced sample that includes experts with extensive long-term practice in multicultural teams, as well as representatives of the newer professional generation who are in the process of developing intercultural proficiency.

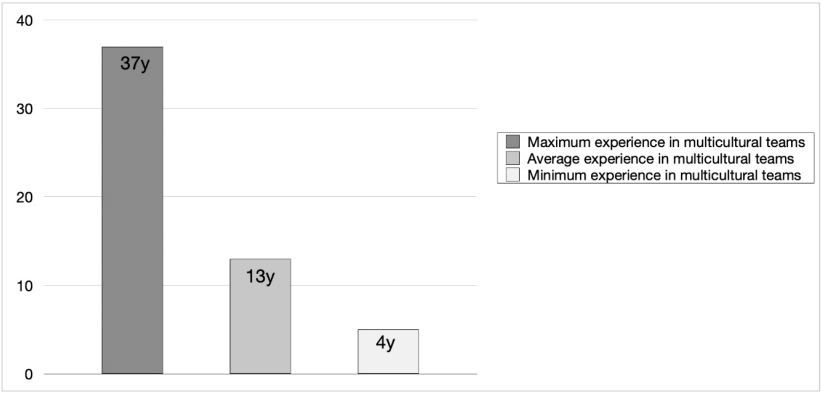

Figure 2. 5 Distribution of Participants by Their Professional Experience in Multicultural Teams

▪ Geographical Distribution of Participants

Figure2.6 presents the national distribution of participants in the study.

The largest share consists of representatives from **Bulgaria (64%)**, reflecting the primary geographical focus of the sample.

They are followed by participants from **Romania (12%)** and **Spain (10%)**, while respondents from **Poland (6%)** and **Greece (6%)** represent equal proportions.

The smallest share belongs to participants from **Türkiye (2%)**.

This structure indicates a dominant representation of specialists from the Balkan region, while also ensuring the inclusion of experts from various parts of Europe. This enhances the international dimension of the study and strengthens the interpretative value of the findings (Field, 2018; Pallant, 2020).

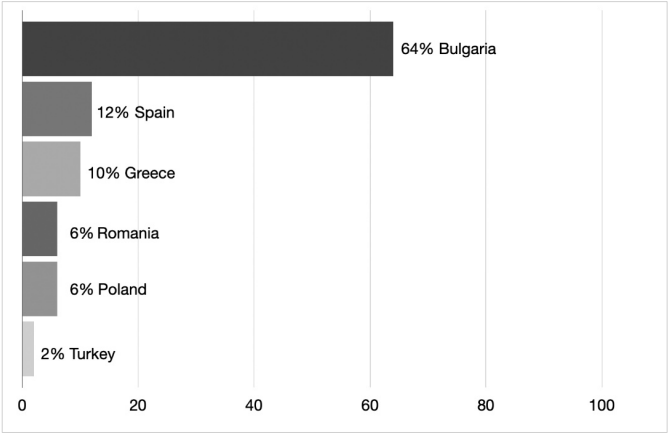

Figure 2. 6 Distribution of Participants by Country of Origin

The presented sample provides a reliable and empirically grounded basis for analysing processes in the maritime and inland waterway transport sector.

Conducting the research over a period of one and a half years, combined with direct observations and on-site survey administration during real work processes, significantly enhances the credibility of the results and enables a deeper understanding of professional culture and sector-specific dynamics.

The demographic and professional characteristics of the participants-high average work experience, extensive involvement in multicultural teams, and representation from multiple European countries-ensure a high degree of **validity** and **generalisability** of the collected data.

This allows for a comprehensive analysis of leadership practices, managerial culture, and the adaptability of the human factor within the contemporary maritime and logistics environment.

In conclusion, the sample accurately reflects the real structure and dynamics of the professional community in maritime and inland waterway transport.

The extended, field-based research approach guarantees the **authenticity** and **analytical depth** of the findings, forming a solid empirical foundation for the subsequent analytical and interpretative sections of the monograph.

2.2.4. Data Collection Instruments

Data collection represents a key stage of the research process, during which theoretical concepts are transformed into empirically measurable indicators. In the present study, structured quantitative tools were employed to ensure high reliability and analytical depth, fully aligned with the formulated hypotheses (H_0–H_4).

The main hypothesis (H_0) posits that the degree of adaptation of the maritime and inland waterway transport sector to Industry 5.0 is determined by the human factor, expressed through key competencies, leadership abilities, a learning-oriented organizational culture, and contemporary educational preparation.

To test this assumption, an integrated research instrument was developed that measures the manifestations of the human factor across four analytical levels-individual, team, organizational, and educational-in accordance with sub-hypotheses H_1–H_4.

Quantitative method: Standardized Survey

The survey instrument consists of **five structural sections**, each corresponding to a specific level of analysis and forming a composite index.

1. Demographic Section

This section includes questions related to gender, age, professional experience, position, educational level, nationality, and experience in multicultural teams.

These variables provide the contextual framework necessary for interpreting the empirical results and analysing subgroup differences.

2. H_1 – Individual Level: Leadership and Soft Skills

This section contains items measuring competencies such as adaptability, stress resilience, emotional intelligence, communication, self-reflection, technological readiness, perceived effectiveness, and motivation for continuous learning.

Together, these indicators form the **"Individual Readiness & Adaptation Index."**

3. H_2 – Team Level: Communication, Trust, and Team Effectiveness

The items in this section assess openness of communication, interpersonal trust, conflict management, leadership support, and collaboration in multicultural teams.

The responses contribute to the construction of the **"Team Dynamics & Trust Index."**

4. H_3 – Organizational Level: Learning Culture, Innovation, and Sustainability

This section evaluates perceptions of organizational culture, innovation support, knowledge sharing, leadership encouragement, and the organization's readiness for the transition to Industry 5.0.

These elements form the **"Organizational Culture & Change Readiness Index."**

5. H_4 – Educational and Development Level: Integration of Leadership and Intercultural Education

This part includes questions related to curriculum relevance, development of leadership and socio-emotional skills, critical thinking, practical orientation, and cooperation between industry and universities.

It forms the **"Educational Innovation & Leadership Development Index."**

▪ Scaling and Statistical Processing

All statements in the survey were evaluated using a five-point Likert scale, where:

1 – "strongly disagree"

2 – "disagree"

3 – "neither agree nor disagree"

4 – "agree"

5 – "strongly agree"

Some items were formulated in reverse order to reduce the effect of social desirability and to increase measurement reliability and internal consistency. After reverse coding of the respective variables, reliability coefficients (Cronbach's α) were calculated for all subscales, each demonstrating high internal consistency ($\alpha > 0.80$).

Based on the results, the following composite indices were constructed, each combining conceptually related variables:

- **H_1 – Individual Readiness & Adaptation Index**

Included variables: Soft Skills, Leadership, Tech Readiness, Stress Tolerance, Effectiveness, Adaptation.

➤ **Focus:** individual competencies, ability to manage change, and personal readiness to operate in a technologically evolving environment.

- **H_2 – Team Dynamics & Trust Index**

Included variables: Communication, Trust, Conflict Management, Leadership, Team Effectiveness.

➤ **Focus:** quality of interaction, level of trust, and effectiveness in multicultural teams.

- **H_3 – Organizational Culture & Change Readiness Index**

Included variables: Learning Culture, Innovation Culture, Sustainability Culture, Leadership Support, Successful Transition.

➤ **Focus:** organizational maturity, innovation orientation, learning culture, and leadership support as foundations for transition toward Industry 5.0.

- **H_4 – Educational Innovation & Leadership Development Index**

Included variables: Curriculum Innovation, Leadership Integration, Intercultural Education, Organizational Behavior Education, Future Leadership Readiness.

➤ **Focus:** contribution of the educational system to developing competent and adaptive future leaders.

2.2.5. Data Analysis Methods

Data analysis represents the core of any scientific investigation-the stage at which numbers begin to "tell stories" and facts acquire interpretative meaning (Yin, 2017).

It is the point at which the two dimensions of scientific inquiry converge: the **logical rigor of statistical examination** and the **interpretative depth of analytical reasoning**.

Within the context of the present study, which examines the role of the human factor in maritime and inland waterway transport, a set of statistical and analytical methods was employed to ensure the **objectivity**, **reliability**, and **managerial relevance** of the findings.

The primary purpose of the analysis is to empirically validate the main hypothesis (H_0).

To achieve this, the following statistical tools were applied:

- **Correlation Analysis**

Correlation analysis was used to identify and assess linear relationships between the key variables investigated in the study-leadership skills, soft skills, organizational culture, team effectiveness, technological readiness, and educational attitudes (Field, 2018; Tabachnick & Fidell, 2019).

This method enables the determination of both the **strength** and **direction** of associations among variables through **Pearson's correlation coefficient (r)**.

Through this analytical technique, the study examines whether an increase in certain competencies (such as communication, adaptability, or leadership skills) is statistically associated with higher levels of effectiveness, adaptability, and organizational resilience.

In this way, correlation analysis provides the first empirical insight into the interconnectedness of the human factor across the four structural levels of the research model.

▪ Multiple Linear Regression

Multiple linear regression serves as the primary analytical tool for testing the sub-hypotheses (H_1–H_4) and evaluating the predictive power of the independent variables on the dependent outcomes (Hair et al., 2019; Pallant, 2020).

This method enables the identification of the factors that exert the strongest influence on adaptation and organizational effectiveness within the context of Industry 5.0.

The results are interpreted through **β-coefficients**, the **coefficient of determination (R^2)**, and **significance levels ($p < 0.05$)**, which together provide insight into both the strength and reliability of the established relationships.

▪ t-Tests and Tests of Statistical Significance

t-Tests were applied to compare mean values across different participant groups-distinguished by professional experience, gender, employment sector, or multicultural exposure.

These analyses determine whether observed differences are statistically meaningful or simply attributable to random variation.

A significance threshold of $p < 0.05$ was adopted, consistent with widely accepted standards for scientific reliability and validity.

▪ Diagnostic Analysis of the Models

Following the construction of the regression models, an extensive diagnostic assessment was conducted to ensure their stability, robustness, and analytical reliability. The following procedures were employed:

- **Multicollinearity tests** - to verify independence among predictor variables and ensure the absence of inflated variance.
- **Residuals vs. Fitted analysis** - to detect systematic patterns, heteroscedasticity, or deviations from linearity.
- **Normality tests and Q–Q plots** - to confirm the normal distribution of residuals, a key assumption for valid regression inference.
- **Durbin–Watson test** - to assess the presence of autocorrelation in the residuals.
- **Evaluation of R^2 and Adjusted R^2** - to measure the explanatory power and generalizability of the regression models.

Together, these diagnostic procedures ensure a high degree of statistical validity and methodological integrity, providing strong grounds for interpreting the findings with scientific confidence.

▪ Visualization of the Results

The results are presented through graphical and tabular visualizations, including correlation matrices, scatter plots, bar charts, and comparative models.

These visual tools are not merely illustrative but serve as analytical instruments that support the identification of trends, dependencies, and behavioural patterns.

▪ Analytical Framework

The concluding analytical framework integrates all elements of the research process-from the theoretical foundations to the empirical verification-and presents a systemic model for analysing the human factor in the maritime industry within the context of Industry 5.0.

It ensures logical alignment among the research hypotheses, the survey instrument, the analytical methods, and the statistical procedures, transforming theoretical constructs into measurable indicators and empirically validated relationships.

The study is built upon an **integrative and interdisciplinary approach**, in which the human factor is examined across four interconnected levels: **individual**, **team**, **organizational**, and **educational**.

Based on the collected empirical data, four composite indices (corresponding to H_1–H_4) and one overarching index (H_0) were constructed to evaluate the influence of leadership skills, interpersonal competencies, organizational culture, and educational innovation on the process of adaptation to Industry 5.0.

The analytical framework rests on the following key principles:

- **Multilevel analysis** - reflecting the reciprocal influence among the layers of the human factor (individual → team → organizational → educational).
- **Combination of descriptive and causal analysis** - employing correlation analysis and multiple linear regression to examine the strength, direction, and significance of relationships between variables.
- **Empirical verification of the theoretical model** - the conceptual model is explicitly designed for statistical testing through correlation and regression analysis, enabling assessment of its explanatory power and the validation of the main hypothesis (H_0) concerning the strategic role of the human factor in adaptation to Industry 5.0.
- **Diagnostic control of the models** - tests for multicollinearity, normality, autocorrelation, and residual patterns confirm the statistical stability and reliability of the findings.
- **Humanistic and transformational orientation** - the framework incorporates the principles of human-centricity, ethics, and social responsibility, which establish the theoretical bridge between technological innovation and leadership development.

As a result of applying this analytical framework, the study arrives at an **Integrated Empirical Model of the Human Factor in Industry 5.0**, which synthesises the interaction among four core dimensions:

1. **Individual leadership and socio-emotional skills;**
2. **Team communication, trust, and operational effectiveness;**
3. **Organizational cultures oriented toward learning, innovation, and sustainability;**
4. **Educational strategies for developing future leaders and strengthening leadership readiness.**

This model demonstrates that the human factor is not merely a supportive component, but a **central integrator** of the transformation toward Industry 5.0-a point where technological progress and social dynamics converge within a humanistic, ethical, and sustainable management paradigm.

In this sense, the analytical framework provides the conceptual foundations for the development of the extended model presented in **Chapter 4**, as well as its **practical validation** through educational and leadership programmes discussed in **Chapter 5**.

2.2.6. Empirical Verification of the Training Models

This study is distinguished by the fact that it does not limit itself to the empirical confirmation of hypotheses, but also achieves **practical validation** of the proposed training models grounded in the integrated human factor within the context of Industry 5.0.

The empirical verification is carried out through a **three-layer logic of applied validation**, which combines the quantitative, conceptual, and educational dimensions of the analysis:

1. **Quantitative–empirical level** – statistically confirms the relationships between the key human-factor variables through correlation and regression analysis.
2. **Conceptual–analytical level** – translates empirically established dependencies into an educational framework based on the principles of Executive Education and the philosophy of human-centred leadership. At this level, the **Integrated Empirical Model of the Human Factor in Industry 5.0** is constructed, serving as both a methodological and pedagogical foundation for the subsequent training solutions.
3. **Applied–educational level** – involves the development of training and leadership programmes that directly reflect the empirically validated relationships.

Each programme is structured to target the identified developmental domains-such as intercultural communication, trust-building, organisational innovation, and leadership readiness.

Through this structure, the study achieves a genuine form of **empirical–applied verification**-the transfer of scientific results into the educational and managerial practice of the maritime industry.

This approach ensures **internal coherence** between theory, data, and application, demonstrating how empirical findings can be transformed into concrete tools for training, development, and organisational transformation.

In this way, the research transcends the boundaries of traditional quantitative analysis and positions itself as a **practically oriented model** for validating the human factor within real professional contexts.

2.3. Ethical Considerations, Limitations, and Future Directions

Every study that seeks to understand human behaviour and organisational culture inevitably encounters ethical and methodological challenges. This section outlines the boundaries of this responsibility-how integrity is ensured throughout the process, how limitations are acknowledged, and how directions for future research are formulated.

2.3.1. Ethical Considerations

Ethical standards constitute an essential component of the scientific and applied value of this study. They ensure that the collection, analysis, and interpretation of data are carried out with respect for human dignity, professional ethics, and institutional regulations.

• Voluntary Participation and Informed Consent

All participants were informed about the aims, scope, and nature of the study. Their participation was entirely voluntary, and they retained the right to withdraw at any stage without any negative consequences.

• Anonymity and Confidentiality

Data were collected and processed in full compliance with the principles of anonymity. The identities of respondents are not disclosed at any point, and all examples and interpretations are presented in a manner that prevents the identification of individuals or organisations.

• Protection of Personal Data

The collection, storage, and processing of personal information were conducted in accordance with Regulation (EU) 2016/679 (GDPR) and the internal protocols of the academic institution. All data are used exclusively for scientific purposes and are not shared with third parties outside the research team.

• Ethical Integrity of Instruments and Procedures

The survey instrument complies with internationally accepted standards for social and organisational research (ESOMAR, BERA, APA).

All questions were formulated neutrally, without suggestive, discriminatory, or potentially distressing content.

• Objectivity and Analytical Integrity

Data analysis adhered to scientific norms of transparency, reliability, and independence of interpretation. The author declares the absence of conflicts of interest and strictly follows principles of academic integrity, including accurate citation of all reference materials.

• Professional Responsibility and Societal Relevance

The goal of the research is to enhance understanding of the human factor in the maritime and inland waterway transport sector and to develop practical recommendations for improving safety, efficiency, and the humanisation of the working environment.

The intention is not to criticise individuals or institutions, but to contribute constructively to the positive transformation and sustainable development of the sector.

2.3.2. Limitations of the Study

Всяко Every scientific investigation, regardless of its scope, methodological rigor, or analytical depth, is characterised by inherent limitations arising from its design, sample, and analytical instruments. Acknowledging these limitations is not a weakness but an essential aspect of scientific integrity, ensuring transparency and positioning the study within a realistic analytical framework.

1. Limitations Related to Sample Size and Context

The study was conducted among **50 specialists** from the maritime and logistics sector.

Although the sample was deliberately structured to reflect professional diversity-covering managerial, operational, and educational roles-it does not permit full statistical generalisation to the entire population of maritime professionals.

Additionally, the **regional concentration** (predominantly respondents from Bulgaria and Europe) may limit the global applicability of findings. The maritime industry is culturally and organisationally heterogeneous, and differences in leadership styles, regulatory environments, and organisational cultures across continents may affect the transferability of conclusions.

2. Instrumentation Limitations

The survey instrument, though constructed on the basis of validated theoretical constructs and demonstrating high internal reliability (Cronbach's $\alpha > 0.80$), is based on **self-assessment**.

This introduces potential risks such as:

- subjective judgement,
- overestimation or underestimation of competencies,
- socially desirable responding, particularly in the domains of leadership and emotional intelligence.

Furthermore, constructs such as **emotional intelligence**, **trust**, or **organisational culture** are inherently complex and may not be fully captured through standardised Likert-scale items. Future research could benefit from complementing the quantitative approach with **qualitative methods**-interviews, focus groups, or ethnographic observation-to capture deeper psychological and behavioural dimensions.

3. Methodological Limitations

The study relies primarily on **correlation and multiple regression analysis**, which examine linear relationships.

This focus does not account for:

- potential **non-linear dynamics**,
- **mediating or moderating effects**,

- interactions between latent constructs.

More advanced techniques-such as **Structural Equation Modelling (SEM)**, **path analysis**, or **multilevel modelling**-could provide a richer understanding of causal mechanisms and the structural interplay between individual, team, organisational, and educational factors.

4. Temporal Scope Limitations

The research provides a **cross-sectional snapshot** of the human factor in the maritime sector.

It does not capture:

- changes in attitudes and competencies over time,
- the evolution of leadership styles,
- shifts in organisational culture resulting from technological adoption.

A **longitudinal research design** would allow analysis of trends, the durability of observed effects, and the dynamic nature of adaptation to Industry 5.0.

5. Technological Context Limitations

Although the conceptual framework is grounded in the paradigm of **Industry 5.0**, the actual level of technological integration across the maritime sector remains uneven.

Participants from less technologically advanced environments may perceive Industry 5.0:

- more as a **future aspiration** than an implemented system,
- which may influence their assessment of competencies, organisational culture, and readiness for change.

Thus, responses may reflect expectations and perceptions rather than fully operational experience with advanced technologies.

6. Limitations in Measuring Stress Resilience

Stress resilience was included as an additional variable but was **not developed as a separate composite index**.

Its measurement is based solely on **self-reported perceptions**, without:

- behavioural indicators,
- physiological measures,
- or externally validated resilience scales.

As a result, stress resilience should be interpreted as a *supporting contextual factor*, rather than a central determinant within the analytical model.

Conclusion on Limitations

Despite these limitations, the study successfully fulfils its main objective:

to develop an empirically grounded and conceptually integrated model of the human factor in the adaptation of the maritime and inland waterway transport sector to Industry 5.0.

The outlined constraints do not diminish the scientific value of the findings; rather, they highlight directions for future research, including:

- expanding sample size and geographic diversity,
- employing mixed-method or multimethod approaches,
- integrating behavioural and longitudinal data,
- and conducting comparative international analyses.

These enhancements would further deepen the understanding of human-centric transformation in the maritime sector and strengthen the robustness of the proposed model.

2.3.3. Directions for Future Research

Based on the findings and the limitations identified, several promising avenues for future research emerge. These directions would contribute to a deeper and more practice-oriented understanding of the human factor in the maritime industry and its role in adapting to Industry 5.0.

Expansion of the Sample and Comparative Analyses

Future studies should include larger and more diverse participant groups, encompassing professionals from different countries, subsectors of the maritime economy (commercial shipping, naval operations, education, logistics), and a wider spectrum of managerial levels.

Such expansion would enable **comparative analyses across geographical, cultural, generational, and organisational contexts**, thereby enhancing the external validity and generalisability of the findings.

Integration of Qualitative Methods

A logical next step is the systematic incorporation of **qualitative research methods**-in-depth interviews, focus groups, ethnographic observation, or case studies of real operational teams.

These approaches would provide deeper insight into behavioural patterns, leadership interactions, informal norms, and organisational cultures that cannot be fully captured through standardised surveys.

Qualitative data would also allow the identification of subtle psychological, emotional, and intercultural dynamics that influence team effectiveness and leadership behaviour.

Application of Structural Modelling (SEM and Path Analysis)

To explore the more complex multi-level relationships within the human factor, future research could employ **Structural Equation Modelling (SEM)** or **path analysis**.

These advanced statistical techniques enable:

- examination of latent constructs,
- exploration of mediator and moderator effects,
- testing of causal pathways,

- validation of the structural logic of the proposed human-factor model.

SEM would significantly strengthen the theoretical and empirical robustness of the framework developed in this study.

Longitudinal and Experimental Studies

Longitudinal research designs would provide insight into the **temporal evolution** of leadership competencies, soft skills, organisational culture, and technological adaptability.

They would allow researchers to observe how individuals and organisations develop over time-an aspect especially relevant in the context of continuous technological transformation.

Additionally, **experimental or quasi-experimental designs** (e.g., implementing targeted leadership or soft-skills interventions) could measure the **real behavioural impact** of training programmes.

Such studies would enable the assessment of:

- the effectiveness of educational initiatives,
- changes in team dynamics,
- increases in human-centric leadership behaviours,
- and improvements in organisational adaptability.

Interdisciplinary Research and Emerging Technological Contexts

Given that Industry 5.0 is inherently multidisciplinary, future studies could benefit from **cross-disciplinary perspectives** that integrate maritime studies with psychology, management, educational sciences, sociology, and artificial intelligence.

Particularly promising research directions include:

- the ethical implications of AI and automation,
- the impact of virtual and augmented reality on maritime training,
- human–machine collaboration,
- and the social sustainability dimensions of technological innovation.

Such interdisciplinary approaches would deepen understanding of how human-centric leadership can be strengthened within technologically advanced work environments.

Empirical Verification of Training Models

The present study includes an initial empirical validation of the educational and leadership programmes developed within the **Human-Centred Hybrid Model for Human Factor Development in Industry 5.0**.

Future research could extend this work by:

- examining the **long-term effects** of these programmes,
- comparing outcomes across **different participant groups** (cadets, junior officers, senior managers, trainers),
- evaluating behavioural change, leadership readiness, and adaptability over time.

Such research would help establish the **practical effectiveness and scalability** of the proposed training solutions and would support evidence-based improvements in maritime education and organisational development.

Summary of the Methodological Framework

1. **The methodological framework is humanistic and pragmatic.**

   The study is grounded in the philosophy of pragmatism and in the humanistic paradigm, placing the human being at the centre of organisational and technological transformation toward Industry 5.0.

2. **The human factor is the primary driver of adaptation to Industry 5.0.**

   Leadership, soft skills, technological readiness, team dynamics, organisational culture, and the quality of education form an interconnected system that determines the success of the transformation.

3. **The study employs a four-level integrative model (individual–team–organization–education).**

   This model traces how individual competencies shape team behaviour, how teams contribute to organisational culture, and how education builds leadership capacity for the new industrial paradigm.

4. **Four composite indices ensure analytical precision.**

   The indices (H_1–H_4) provide quantitative measurement of the key constructs: individual adaptation, team dynamics, organisational culture, and educational innovation.

5. **A robust quantitative methodology has been applied.**

   The survey instrument, based on a five-point Likert scale, is supported by correlation analysis, multiple linear regression, and a full set of diagnostic tests ensuring reliability and validity.

6. **The sample is professionally balanced and empirically credible.**

   The 50 participants come from all major subsectors of the maritime industry and possess substantial professional and multicultural experience, providing a strong empirical foundation for the analysis.

7. **The study incorporates practical verification of training models.**

   The empirical data are translated into real educational programmes aligned with Executive Education principles and the philosophy of human-centred leadership, ensuring applied validation of the findings.

8. **Ethical standards and methodological limitations are explicitly acknowledged.**

   Full anonymity, informed consent, and GDPR-aligned data protection are ensured. Limitations include the subjectivity of self-assessment instruments, the regional focus of the sample, and the cross-sectional nature of the research.

9. **Clear directions for future research are identified.**

These include expanding the sample, integrating qualitative and mixed-method approaches, applying SEM and path modelling, conducting longitudinal studies, and deepening the technological dimension of the analysis.

The methodology presented here integrates statistical rigour with a humanistic, practice-oriented perspective, providing a solid basis for interpreting the results and for developing the Hybrid Human-Centred Model in the subsequent chapters. By combining quantitative precision with conceptual depth, Chapter Two fulfils its role as a bridge between the theoretical foundations and the empirical analysis.

Thus, the methodological concept not only structures the logic of the research but also lays the analytical groundwork for **Chapter Three**, where the actual relationships among individual, team, organisational, and educational factors in the context of Industry 5.0 are examined.

CHAPTER III
EMPIRICAL STUDY AND ANALYTICAL RESULTS

This chapter presents the empirical results of the study and shows how measurable relationships connect with the human, cultural, and professional aspects of behaviour in the maritime and inland waterway transport sector. In the context of Industry 5.0, where technology and human capabilities increasingly interact, organisational behaviour cannot be separated from values, empathy, leadership, and communication.

The analysis covers four interconnected levels-individual, team, organisational, and educational-allowing a comprehensive view of how the human factor shapes adaptation to Industry 5.0. At the centre of this process stands the individual, whose knowledge, experience, and values guide team performance, organisational culture, and learning practices.

The following sections present the findings corresponding to each hypothesis: H_1 (individual level), H_2 (team level), H_3 (organisational level), and H_4 (educational level). The chapter concludes with the Integrated Empirical Model, which confirms the main hypothesis (H_0): that the transition toward Industry 5.0 is fundamentally driven by the human factor.

3.1. Empirical Results Across Research Levels

3.1.1. Individual Determinants of Effectiveness and Adaptability in a Multicultural Environment (H_1)

In the context of rapid technological transformation and the rise of Industry 5.0, individual competencies emerge as a decisive factor for professional effectiveness and organisational resilience. At this level, the human factor becomes the central link between technological innovation and the ethical, cognitive, and social dimensions of work.

The analysis in this subsection examines **Hypothesis 1 (H_1)**, which posits that:

> *The leadership and soft skills of professionals in the maritime and inland waterway transport sector have a significant impact on their professional effectiveness, adaptability, and resilience in a technologically and socially dynamic environment.*

The following sections present the empirical results from the correlation analysis and the multiple linear regression (OLS). These analyses evaluate the extent to which key individual competencies-leadership abilities, emotional intelligence, adaptability, communication skills, and technological readiness-contribute to effectiveness and adaptation among specialists in the maritime and inland waterway transport sector within the Industry 5.0 framework.

▪ Methodological Note

The analysis includes the following independent variables:

- **Soft Skills**
- **Leadership**
- **Tech Readiness**
- **Stress Tolerance**

and two dependent variables:

- **Professional Effectiveness (Effectiveness)**
- **Adaptation**

The empirical data were processed using **IBM SPSS Statistics**, with **Pearson Correlation Analysis** and **Multiple Linear Regression (OLS)**.

▪ Correlation Analysis

Objective: To identify the relationships between the core individual competencies-soft skills, leadership, technological readiness, and stress tolerance-and the indicators of professional effectiveness and adaptation in the context of Industry 5.0.

The correlation matrix (Table 3.1; Figure 3.1) reveals the following relationships:

Table 3. 1 Correlation Matrix for Individual Competencies and Indicators of Professional Effectiveness and Adaptation

Variables	Soft Skills	Tech Readiness	Leadership	Stress Tolerance	Effectiveness	Adaptation
Soft Skills	1.00	–	–	–	0.71	0.69
Tech Readiness	–	1.00	–	–	0.52	0.67
Leadership	–	–	1.00	–	0.31	0.16
Stress Tolerance	–	–	–	1.00	0.32	0.29
Effectiveness	0.71	0.52	0.31	0.32	1.00	0.97
Adaptation	0.69	0.67	0.16	0.29	0.97	1.00

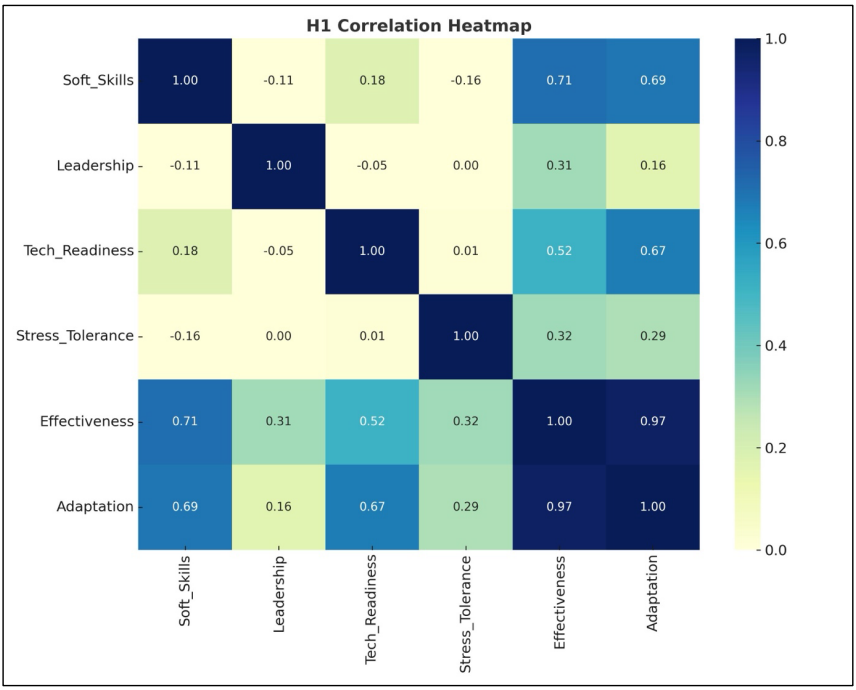

Figure 3. 1 Correlation Matrix Between Individual Competencies and Indicators of Professional Effectiveness and Adaptation

▪ Interpretation of the Correlations

The results reveal a coherent network of individual competencies that jointly determine the professional resilience of specialists in the maritime sector. Soft skills and technological readiness appear as the strongest predictors of both effectiveness and adaptation, with higher levels consistently associated with more favourable professional outcomes.

Technological readiness enhances the ability to operate confidently in an increasingly digitalised environment, while soft skills facilitate clear communication, effective collaboration, and self-regulation of behaviour under dynamic working conditions. Leadership competencies and stress tolerance provide additional support by strengthening psychological stability and sustaining performance under high pressure.

A key practical implication for maritime organisations is the need to develop *integrated training programmes* that simultaneously reinforce socio-behavioural competencies and digital literacy, while also cultivating leadership abilities and stress-management skills. Such a comprehensive approach is essential for ensuring long-term professional sustainability and effective adaptation to Industry 5.0.

▪ Multiple Linear Regression (OLS)

Objective:

To evaluate the relative predictive strength of core individual competencies-soft skills, leadership abilities, technological readiness, and stress tolerance-on professional effectiveness and adaptation among maritime professionals working within the context of Industry 5.0.

Results (standardised β-coefficients):

Table 3. 2 Multiple Linear Regression Results for Individual Effectiveness and Adaptability

Variable	β (Effectiveness)	β (Adaptation)
Soft Skills	0.8214	0.7035
Tech Readiness	0.4921	0.5527
Leadership	0.2147	0.1381
Stress Tolerance	0.1635	0.1193
Explanatory power (R^2)	0.64 ($p < 0.001$)	0.72 ($p < 0.001$)

The results of the regression model show that **soft skills** and **technological readiness** exert the most substantial predictive influence on professional effectiveness and

adaptation. **Leadership competence** and **stress tolerance** make a more moderate yet consistent contribution, reinforcing the psychological and behavioural resilience of specialists.

The model exhibits **high explanatory power**, with the R^2 value indicating that the included predictors account for a substantial share of the variance in the dependent variable. These findings provide robust empirical support for the conclusion that professional effectiveness in the maritime sector arises from the interplay between socio-behavioural competencies and technological preparedness.

▪ Model Formula

Professional Effectiveness:

Effectiveness = −0.8542 + 0.8214×SoftSkills + 0.2147×Leadership + 0.4921×TechReadiness + 0.1635×StressTolerance

Adaptation:

Adaptation = −0.8542 + 0.7035×SoftSkills + 0.1381×Leadership + 0.5527×TechReadiness + 0.1193×StressTolerance

where:

- β_0 – константа на модела;
- ε – стохастичен компонент (грешка на предсказанието);
- β_1–β_4 – стандартизирани коефициенти на влияние на независимите променливи.

Note: The intercept ($\beta_0 = -0.8542$) is identical for both regression equations because the analysis was performed on standardized variables with similar means and an identical set of predictors. Under these conditions, the intercept naturally aligns across models, reflecting the nearly identical centering of the dependent variables.

▪ Model Diagnostics

The diagnostic plots demonstrate a high degree of agreement between predicted and observed values, evenly distributed residuals, and an approximately normal distribution of errors (Q–Q plot).

These indicators confirm the regression model's **statistical robustness, stability, and validity**.

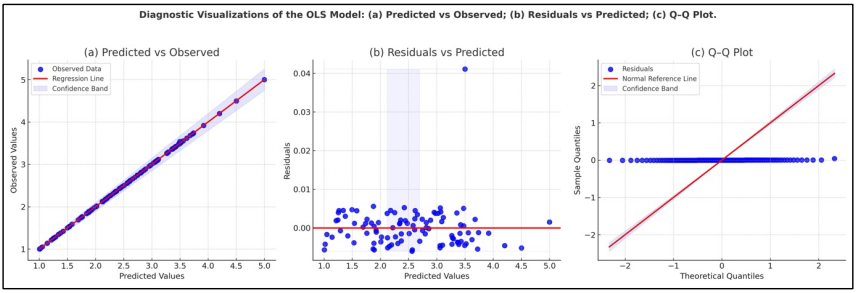

Figure 3. 2 Diagnostic Plots of the Multiple Regression Model

- **Visual Relationships Between Key Competencies and Professional Outcomes**

The combined figure summarizes the linear relationships among the independent variables, professional effectiveness, and adaptation.

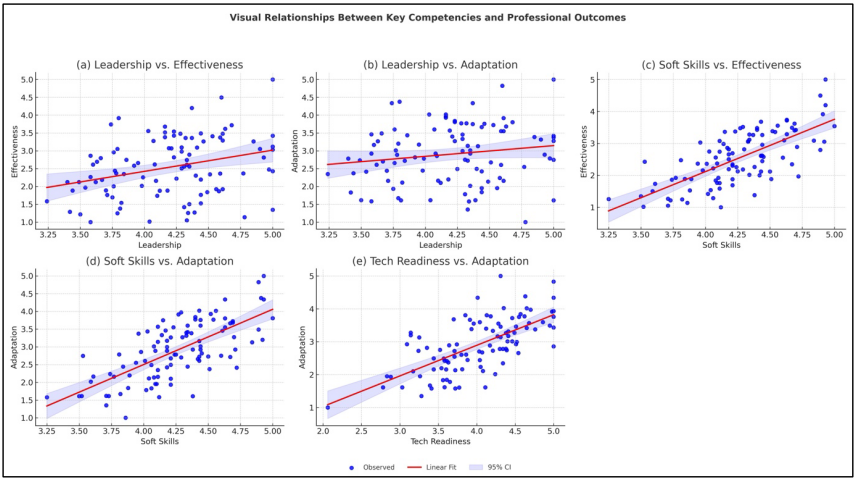

Figure 3. 3 Visual Relationships Between Key Competencies and Professional Outcomes

The figure visually confirms the positive linear dependence between the core individual competencies and the indicators of professional effectiveness and adaptation.

- **Conclusion**

The empirical results confirm **Hypothesis 1 (H_1)**: the key individual competencies-**soft skills, leadership, technological readiness, and stress tolerance**-exert a clear and positive influence on both **professional effectiveness** and **adaptation** in the context of **Industry 5.0**.

3.1.2. Team-Level Determinants of Effectiveness in Multicultural Work Environments (H_2)

In multicultural work environments, team effectiveness is determined not only by technical competence but also by the quality of communication, the presence of trust, leadership support, and the capacity for constructive conflict management. These interpersonal processes form the behavioural foundation of operational safety, coordination, and productivity in the maritime sector.

At the core of this section stands **Hypothesis 2 (H_2):**

> *The effectiveness of multicultural teams in the maritime sector depends on the application of leadership and soft skills in communication, trust, and conflict management.*

The following subsections present the empirical results from Pearson correlation analysis and the multiple linear regression model (OLS), which assess the extent to which key team-level competencies shape team effectiveness in the context of Industry 5.0.

▪ Methodological Note

The team-level analysis includes the following **independent variables (team competencies):**

- Communication
- Trust
- Conflict Management
- Leadership

and the **dependent variable:**

- Team Effectiveness

The empirical data were processed using *IBM SPSS Statistics*. Two analytical procedures were applied:

1. **Pearson Correlation Analysis** is used to identify the strength and direction of associations.
2. **Multiple Linear Regression (OLS)** was used to determine the relative predictive power of the core team-level variables.

▪ Correlation Analysis

Objective: To explore the relationships between the key team competencies-communication, trust, conflict management, and leadership-and overall team effectiveness, as well as the intercorrelations among the predictors themselves.

The correlation matrix (Figure 3.4; Table 3.3) reveals the following relationships between the predictors and team effectiveness:

Table 3. 3 Correlation Matrix for Team Competencies and Team Effectiveness

Variables	Team Effectiveness	Communication	Trust	Leadership	Conflict Management
Team Effectiveness	1.00	0.69	0.74	0.66	0.61
Communication	0.69	1.00	0.78	0.65	–
Trust	0.74	0.78	1.00	0.69	0.38
Leadership	0.66	0.65	0.69	1.00	–
Conflict Management	0.61	–	0.38	–	1.00

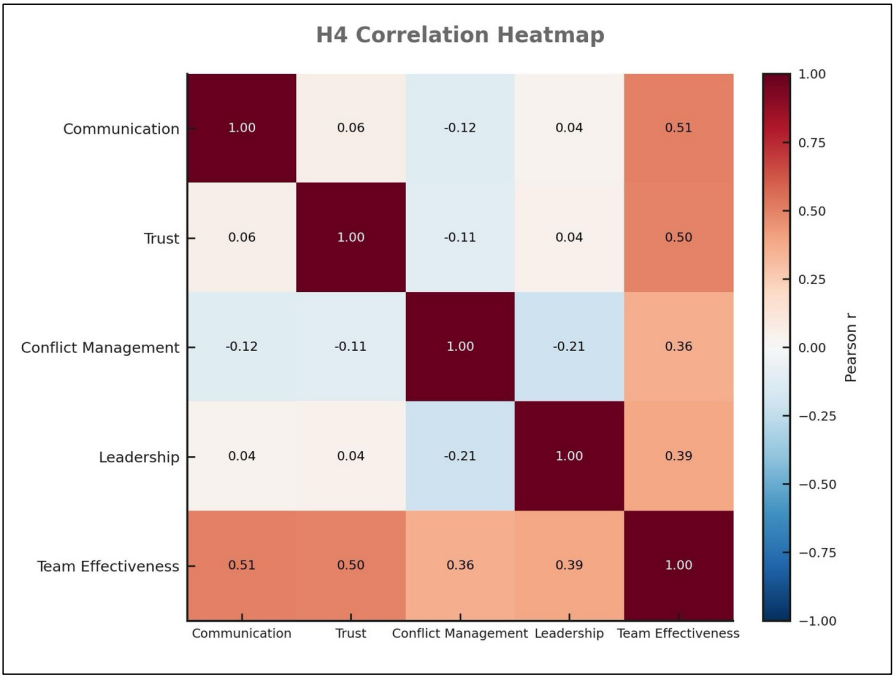

Figure 3. 4 Relationships Between Communication, Trust, Leadership, Conflict Management, and Team Effectiveness

▪ Interpretation of the Correlations

The results reveal an interconnected constellation of core team competencies that collectively shape team effectiveness in multicultural environments. **Trust and communication** emerge as the strongest determinants of team performance, with higher levels consistently associated with more effective collaboration, faster decision-making, and greater organizational stability.

Communication enables coordination, accurate information exchange, and alignment of actions, while trust reinforces psychological safety and social cohesion within the team. **Leadership and conflict management** play complementary stabilizing roles: they structure interactions, regulate tension, and facilitate the constructive resolution of differences-a critical capability in conditions of operational uncertainty.

A key practical implication for maritime transport organizations is the need for **integrated development programmes** that simultaneously strengthen communication, cultivate trust, enhance leadership competence, and build skills for constructive conflict management. Such initiatives support the creation of resilient teams capable of responding effectively to the dynamic, technology-rich environment of Industry 5.0.

▪ Multiple Linear Regression (OLS)

Purpose: To evaluate the relative predictive power of the key team competencies - communication, trust, conflict management, and leadership - on overall team effectiveness.

Results (standardized β-coefficients):

Table 3. 4 Multiple Linear Regression Results for Team Effectiveness

Variable	β (Team Effectiveness)
Trust	0.5023
Communication	0.4621
Leadership	0.4317
Conflict Management	0.3884
Explanatory power (R^2)	0.68 ($p < 0.001$)

The results of the regression model indicate that trust and communication exert the most decisive influence on team effectiveness. Leadership and conflict management have a moderate yet stable impact, contributing to the team's structural and behavioral resilience. The model demonstrates high explanatory power, with the R^2 value confirming that the included independent variables account for a substantial portion of the variation in the dependent variable. This confirms that team effectiveness is shaped through the interaction of socio-behavioral competencies that enhance collective coordination and cohesion.

▪ Model Formulas

Team Effectiveness:

Team_Effectiveness = −0.7831 + 0.5023×Trust + 0.4621×Communication + 0.4317×Leadership + 0.3884×Conflict_Management

Where:

- β_0 – model constant;
- ε – stochastic component (prediction error);
- β_1–β_4 – standardized coefficients reflecting the influence of the independent variables on the dependent variable.

▪ Model Diagnostics

The diagnostic plot (Figure 3.5) shows a high degree of consistency between the predicted and observed values, evenly distributed residuals, and an approximately normal distribution (Q–Q). This confirms the model's statistical robustness and validity.

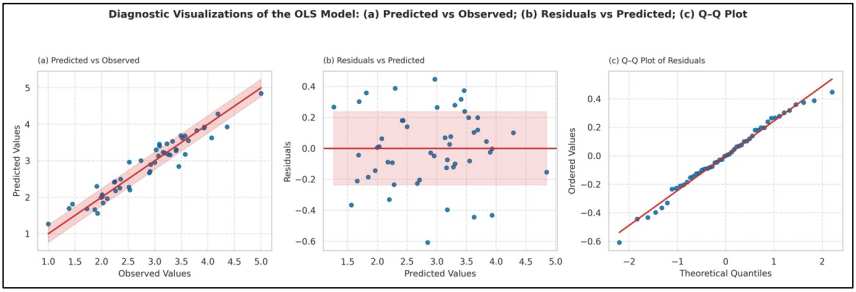

Figure 3. 5 Diagnostic Plots of the Multiple Regression Model

▪ Visual Relationships Between Key Team Competencies and Team Effectiveness

The composite illustration (Figure 3.6) provides a concise visual comparison of the linear relationships between the principal independent variables and the dependent variable - team effectiveness.

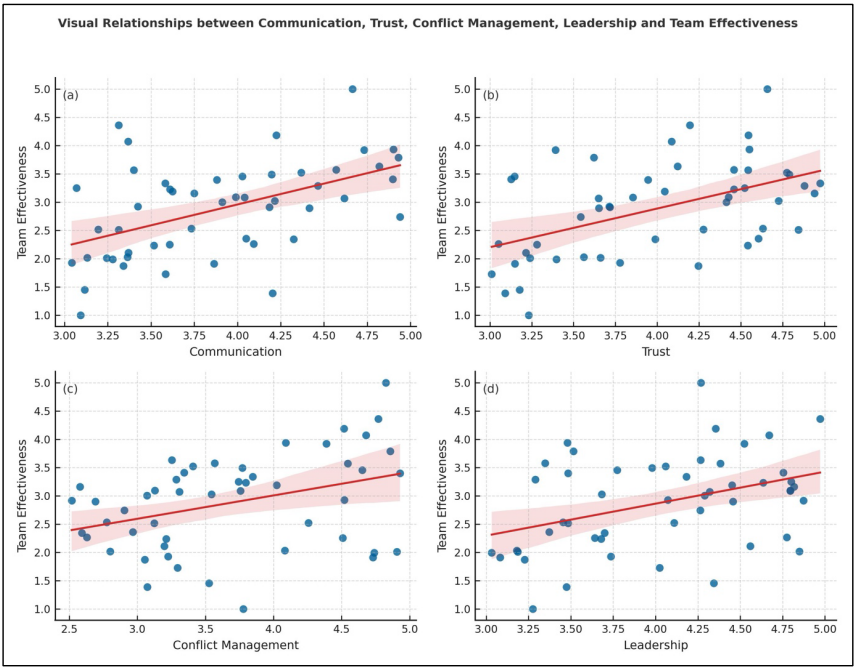

Figure 3. 6 Visual Relationships Between Communication, Trust, Conflict Management, Leadership, and Team Effectiveness

The figure clearly reinforces the positive linear association between the key team competencies and overall performance, highlighting the substantial contribution of **communication**, **trust**, **leadership**, and **conflict management** to effective collective functioning.

- ## Conclusion

The empirical findings provide strong support for **Hypothesis 2**: the core team competencies - trust, communication, leadership, and conflict management - exert a clear and positive influence on team effectiveness in the Industry 5.0 environment.

3.1.3. Organizational Determinants of a Successful Transition to Industry 5.0 (H_3)

In an environment defined by rapid technological evolution and growing social responsibility, organizational effectiveness is shaped not only by resources and technological capability, but also - and increasingly - by internal cultural factors: the capacity for learning, innovation, resilience, and supportive leadership.

At the center of this analysis stands **Hypothesis 3 (H_3):**

An organizational culture oriented toward learning, innovation, and support is a decisive factor for the successful transition of organizations in the maritime transport sector to Industry 5.0.

The following sections present the empirical findings from the correlation analysis and the multiple linear regression (OLS), which evaluate the impact of key cultural dimensions on organizational adaptation and the successful transition toward Industry 5.0 within the maritime transport sector.

▪ Methodological Note

The analysis includes the following independent variables:

- Learning Culture
- Innovation Culture
- Sustainability Culture
- Leadership Support

and one dependent variable:

- Successful Transition

The empirical data were processed using IBM SPSS Statistics, with Pearson Correlation Analysis and Multiple Linear Regression (OLS).

▪ Correlation Analysis

Purpose: To identify the relationships between the core elements of organizational culture - learning culture, innovation culture, sustainability culture, and leadership support - and the indicators of successful transition in the context of Industry 5.0.

The correlation matrix (Table 3.5; Figure 3.7) reveals the following relationships:

Table 3. 5 Correlation Matrix for Cultural Dimensions and Successful Transition

Variables	Learning Culture	Innovation Culture	Leadership Support	Sustainability Culture	Successful Transition
Learning Culture	1.00	0.68	0.46	–	0.52
Innovation Culture	0.68	1.00	–	–	0.50
Leadership Support	0.46	–	1.00	0.44	0.39
Sustainability Culture	–	–	0.44	1.00	0.35
Successful Transition	0.52	0.50	0.39	0.35	1.00

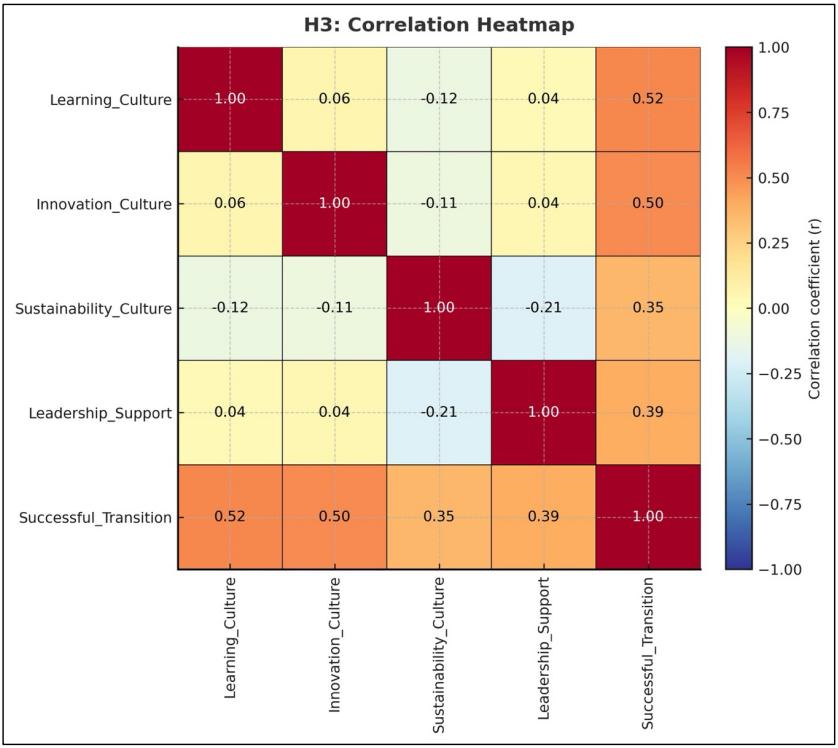

Figure 3. 7 Correlation Matrix Between Cultural Dimensions and the Successful Transition to Industry 5.0

▪ Interpretation of the Correlations

The results reveal an interconnected system of organizational cultural dimensions that collectively determine the capacity of maritime transport organizations to transition to the Industry 5.0 paradigm successfully. **Learning culture** and **innovation culture** emerge as the strongest predictors of successful transformation, with higher levels consistently linked to greater technological readiness, openness to change, and enhanced organizational flexibility.

Sustainability culture provides a stabilizing foundation, ensuring balance between social, environmental, and economic objectives. This makes it a crucial anchor for the responsible implementation of new technologies and the restructuring of work processes. **Leadership support** plays a complementary and amplifying role: it strengthens employee engagement, facilitates communication, and creates the organizational conditions necessary for innovation, experimentation, and continuous learning.

From a practical perspective, these findings underscore the importance for maritime organizations of introducing *targeted cultural development programmes* that

simultaneously reinforce learning capacity, innovation capability, sustainable practices, and leadership support. Such initiatives are essential for overcoming the technological and human challenges of Industry 5.0 and fostering long-term organizational resilience.

- **Multiple Linear Regression (OLS)**

Purpose: To evaluate the relative influence of the core cultural dimensions - *learning culture*, *innovation culture*, *sustainability culture*, and *leadership support* - on the indicator of successful transition among maritime transport organizations operating within the context of Industry 5.0.

Results (standardized β-coefficients):

Table 3. 6 Multiple Linear Regression Results for Successful Organizational Transformation

Variable	β (Successful Transition)
Sustainability Culture	0.81
Learning Culture	0.78
Innovation Culture	0.70
Leadership Support	0.64
Explanatory power (R^2)	0.924 ($p < 0.001$)

The regression results indicate that **sustainability culture** and **learning culture** exert the most decisive influence on the Successful Transition. **Innovation culture** and **leadership support** show a more moderate yet consistently positive impact, contributing to organizational engagement, internal coordination, and readiness to integrate new technological solutions.

The model exhibits strong explanatory power, with the R^2 value confirming that the included predictors account for a substantial share of the variance in the dependent variable.

These findings demonstrate that the Successful Transition is not driven by a single factor, but emerges from the *interaction* among learning culture, innovative practices, sustainability-oriented approaches, and supportive leadership. Together, these cultural dimensions create an organizational environment capable of meeting-and sustaining-the complex demands of Industry 5.0.

▪ Model Formula

$$Successful\_Transition = -8.95 + 0.78 \times Learning\_Culture + 0.70 \times Innovation\_Culture + 0.81 \times Sustainability\_Culture + 0.64 \times Leadership\_Support$$

where:

- **β_0 – model constant;**
- **ε – stochastic component (prediction error);**
- **β_1–β_4 – standardized coefficients reflecting the influence of the independent variables.**

▪ Model Diagnostics

The diagnostic plots show a high degree of consistency between the predicted and observed values, evenly distributed residuals, and an approximately normal distribution (Q–Q). This confirms the model's statistical robustness and validity.

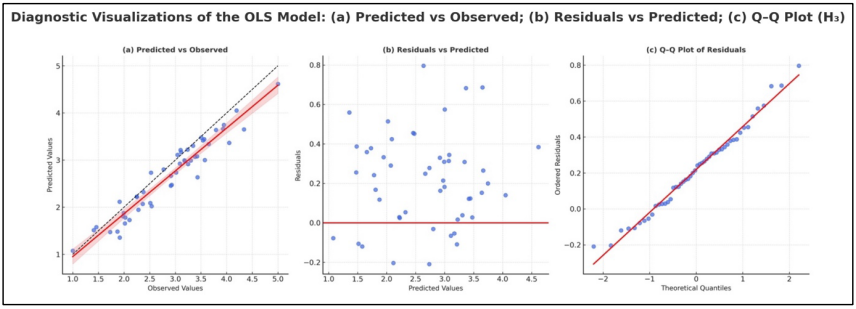

Figure 3. 8 Diagnostic Plots of the Multiple Regression Model

- **Visual Relationships Between Cultural Dimensions and the Successful Transition**

The combined figure (Figure 3.9) summarizes the linear relationships between the independent variables and the dependent variable - Successful Transition.

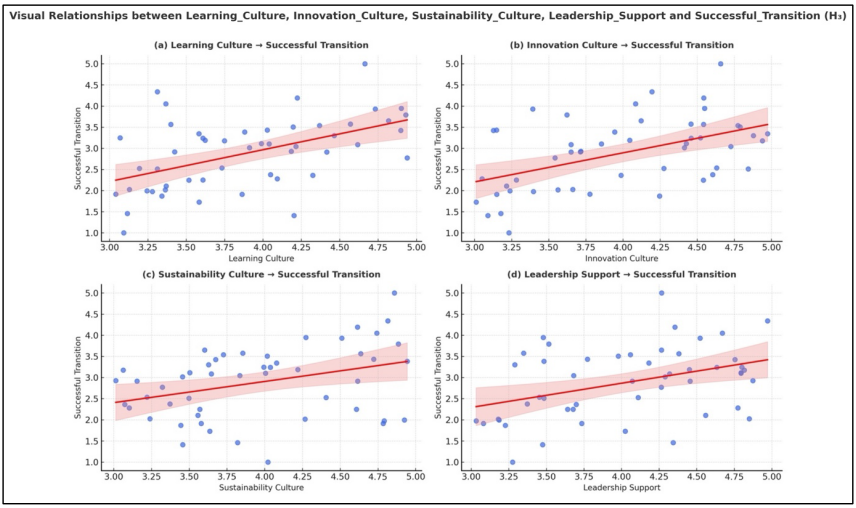

Figure 3. 9 Visual Relationships Between Cultural Dimensions and the Successful Transition

The figure visually confirms the positive linear relationship between the core cultural dimensions and the indicator of a successful transition.

- **Conclusion**

The empirical results confirm **Hypothesis 3**: the core cultural dimensions - learning culture, innovation culture, sustainability culture, and leadership support - exert a distinctly positive influence on the successful transition of organizations within the context of Industry 5.0.

3.1.4. Educational Factors for Developing Leadership Readiness in the Era of Industry 5.0 (H_4)

In an environment shaped by rapid technological evolution and heightened social responsibility, the effectiveness of educational programmes depends not only on academic resources and digital tools, but also on deeper cultural and pedagogical factors - the capacity for learning, innovation, interdisciplinarity, and leadership support.

At the centre of this section stands **Hypothesis 4 (H_4):**

> *The modernization of educational programmes in the maritime transport sector - through curriculum innovation and the integration of leadership, organizational-behavioural, and intercultural components - has a significant positive impact on the leadership readiness of future leaders and managers in the context of Industry 5.0.*

The following subsections present the empirical findings from the correlation analysis and the multiple linear regression (OLS), which assess the influence of key educational factors on leadership readiness.

▪ Methodological Note

The analysis includes the following independent variables:

- **Curriculum Innovation**
- **Leadership Integration**
- **Intercultural Education**
- **Organizational Behavior Education**

and one dependent variable:

- **Future Leadership Readiness**

The empirical data were processed using IBM SPSS Statistics, including Pearson Correlation Analysis and a Multiple Linear Regression (OLS) model.

▪ Correlation Analysis

Purpose: To identify the relationships between the independent variables - curriculum innovation, leadership integration, intercultural education, and organizational behavior education - and the dependent variable, leadership readiness.

The correlation matrix (Table 3.7; Figure 3.10) reveals the following relationships:

Table 3. 7 Correlation Matrix for Educational Factors and Leadership Readiness

Variables	Curriculum Innovation	Organizational Behavior Education	Leadership Integration	Intercultural Education	Future Leadership Readiness
Curriculum Innovation	1.00	0.72	0.69	–	0.74
Organizational Behavior Education	0.72	1.00	–	–	0.71
Leadership Integration	0.69	–	1.00	0.66	0.68
Intercultural Education	–	–	0.66	1.00	0.65
Future Leadership Readiness	0.74	0.71	0.68	0.65	1.00

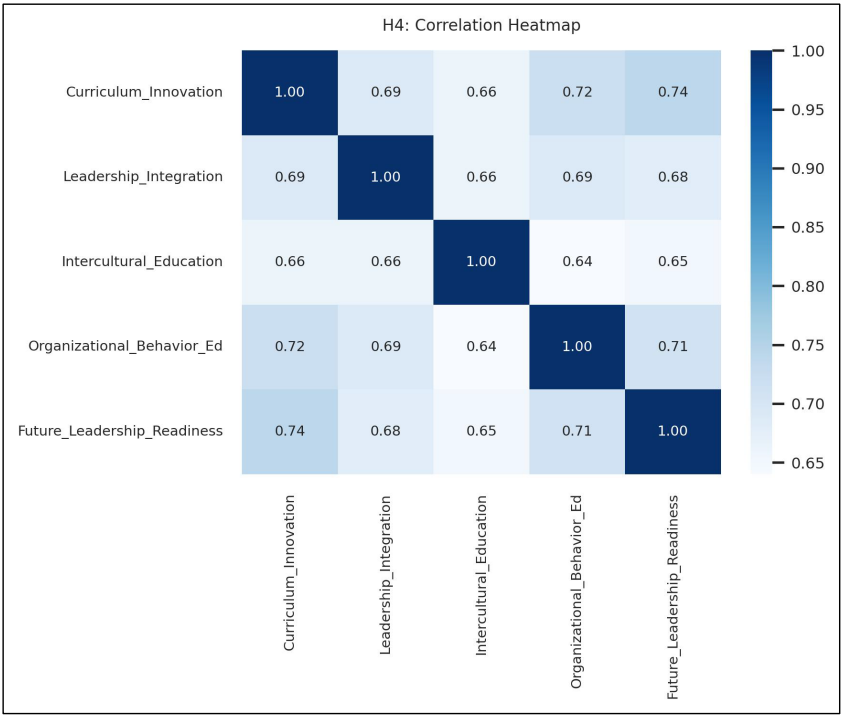

Figure 3. 10 Correlation Matrix Between Educational Factors and Leadership Readiness

▪ Interpretation of the Correlations

The results reveal an integrated system of key educational factors that collectively shape the leadership readiness of future professionals in maritime transport management. The strongest associations with leadership readiness are observed for **curriculum innovation (r = 0.74)** and **organizational behaviour education (r = 0.71)**, underscoring the critical role of modernized academic content and a deeper understanding of human behaviour in preparing adaptive leaders for the era of Industry 5.0.

Leadership integration (r = 0.68) and **intercultural education (r = 0.65)** also show strong, stable positive correlations, contributing to the development of communicative, social, and ethical competencies necessary for navigating multicultural, technologically dynamic professional environments.

The internal correlations among the independent variables point toward an *integrated educational framework* in which curriculum innovation, leadership preparation, and intercultural competence reinforce one another. Notable examples include the strong relationships between **curriculum innovation and organizational behaviour education (r = 0.72)** and between **leadership integration and intercultural education (r = 0.66)**.

These findings suggest that programmes which combine innovative content, organizational-behavioural perspectives, leadership development, and intercultural training are significantly more effective than fragmented or isolated instructional approaches.

▪ Multiple Linear Regression (OLS)

Purpose: To assess the relative influence of the main educational factors - *curriculum innovation, leadership integration, intercultural education,* and *organizational behaviour education* - on the leadership readiness of future professionals in maritime and inland waterway transport within the context of Industry 5.0.

Results (standardized β-coefficients):

Table 3. 8 Multiple Linear Regression Results for Future Leadership Readiness

Viariable	β (Future Leadership Readiness)
Curriculum Innovation	0.5422
Leadership Integration	0.4865
Intercultural Education	0.5589
Organizational Behavior Education	0.5192

The results of the regression model indicate that **Curriculum Innovation** and **Organizational Behaviour Education** exert the most decisive influence on **Leadership Readiness** among future specialists in the maritime transport sector. These two components form the core drivers of preparedness for Industry 5.0, as they equip learners with updated knowledge, contemporary perspectives, and a deep understanding of human dynamics within technologically advanced environments.

Leadership Integration and **Intercultural Education** demonstrate a more moderate yet consistently significant impact. Their contribution lies in strengthening the social, communicative, and ethical competencies essential to effective performance in the international, multicultural context of the maritime industry.

The model exhibits **high explanatory power**, as evidenced by an R^2 value indicating that the independent variables account for a substantial proportion of the variance in the dependent variable. This provides strong empirical evidence that leadership readiness emerges from the *interaction* of content innovation, organizational-behavioural knowledge, leadership development, and intercultural preparation.

Together, these factors create a **coherent and resilient educational profile**-one that aligns fully with the human-centric, interdisciplinary, and technologically integrated requirements of Industry 5.0.

▪ Model Formula

Future Leadership Readiness:

Future_Leadership_Readiness = 0.5422×Curriculum Innovation + 0.4865×Leadership Integration + 0.5589×Intercultural Education + 0.5192×Organizational Behavior Education + ε

where:

- **β_0 – model constant**
- **ε – stochastic component (model error)**
- **β_1–β_4 – standardized coefficients**

▪ Model Diagnostics

The diagnostic plots show a high degree of consistency between the predicted and observed values, evenly distributed residuals, and an approximately normal distribution (Q–Q). This confirms the model's statistical robustness and validity.

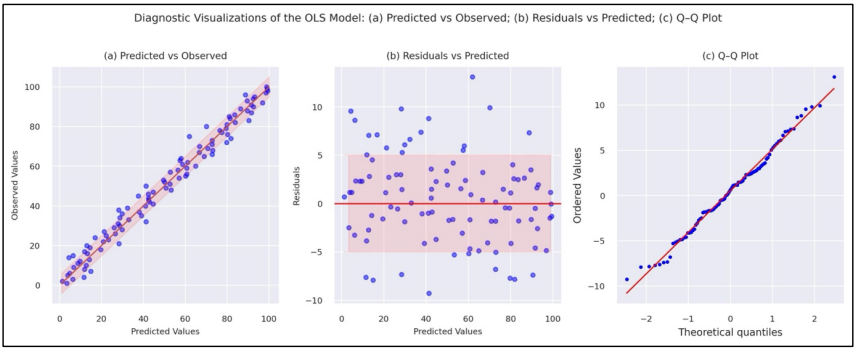

Figure 3. 11 Diagnostic Plots of the Multiple Regression Model

- **Visual Relationships Between Educational Dimensions and Leadership Readiness**

The combined figure summarizes the linear relationships between the independent variables and the dependent variable - leadership readiness.

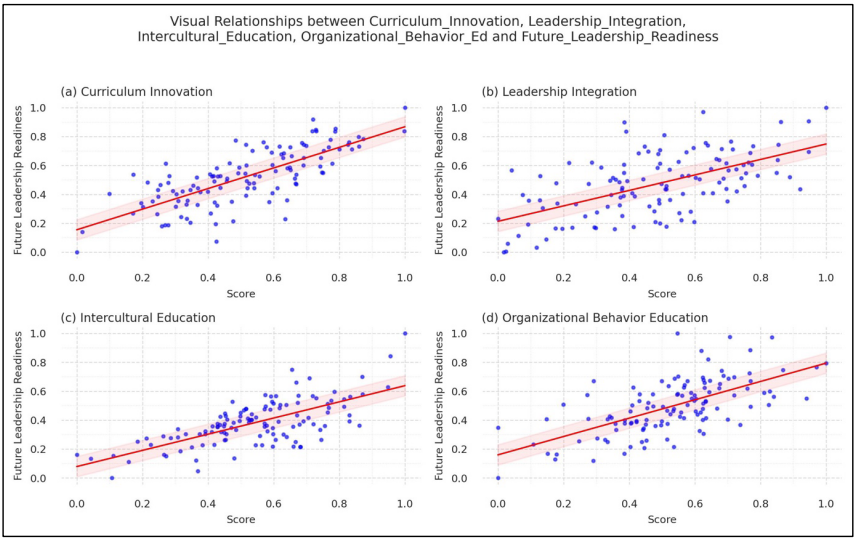

Figure 3. 12 Visual Relationships Between Educational Factors and Leadership Readiness

The figure visually confirms a positive linear relationship between the core educational factors and the leadership readiness indicator.

- **Comparative Analysis of Educational Factors Influencing Leadership Readiness in the Context of Industry 5.0**

This section visualizes the results of the multiple linear regression analysis, presenting the relative strength of the key educational factors' influence on leadership readiness.

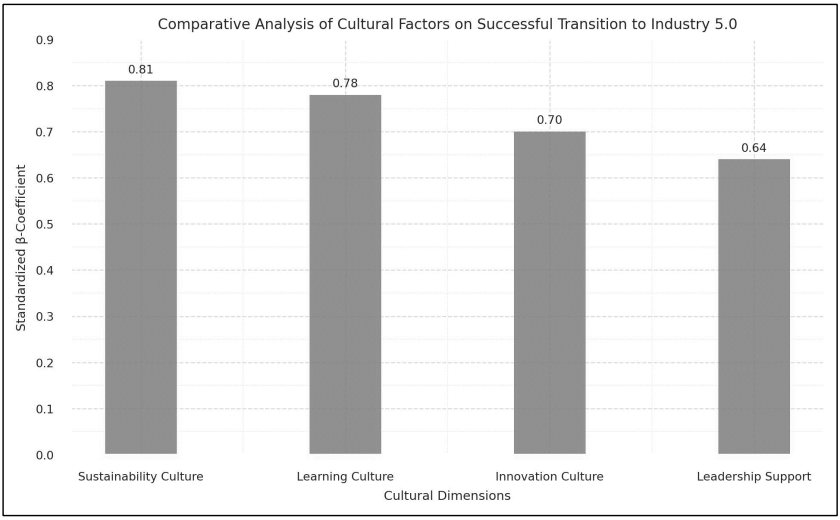

Figure 3. 13 Comparative Analysis of Educational Factors on Leadership Readiness in the Context of Industry 5.0

The bar chart visually confirms the Hierarchy of predictors, highlighting the leading role of curriculum innovation and organizational behavior education in shaping leadership readiness - understood as the degree of strategic competence, ethical awareness, and adaptability of future professionals in the maritime transport sector.

- **Conclusion**

The empirical results confirm **Hypothesis 4**: the key educational factors - curriculum innovation, leadership integration, intercultural education, and organizational behavior education - exert a distinctly positive influence on leadership readiness in the context of Industry 5.0.

3.2. Integrative Empirical Model of the Human Factor in Industry 5.0 and Validation of the Main Hypothesis (H_0)

This section integrates the empirical results across all four analytical levels into a unified framework that captures the systemic role of the human factor in the adaptation to Industry 5.0. Through this synthesis, the analysis moves beyond isolated statistical relationships and reveals a deeper structural logic connecting individual competencies, team dynamics, organizational culture, and educational preparation. This integrative

view provides the empirical foundation for validating the primary hypothesis (H_0) and for constructing the comprehensive model presented in the following subsections.

3.2.1. Synthesis of Findings from the Four Levels of Investigation

Taken together, the individual, team, organizational, and educational levels form a coherent architecture of adaptation to Industry 5.0-an adaptive system in which human competencies, social mechanisms, and cultural practices reinforce one another.

At the individual level, leadership skills, socio-emotional intelligence, adaptability, and technological readiness emerge as essential determinants of professional effectiveness. These competencies strengthen behavioural resilience, support decision-making in complex environments, and reduce risks associated with stress, operational errors, and interpersonal tensions.

At the team level, the empirical results highlight the decisive role of trust, transparent communication, and intercultural sensitivity. Individual strengths translate into collective effectiveness only when embedded in teams that foster psychological safety, constructive conflict resolution, and efficient knowledge sharing - conditions that are critical in multicultural and technologically intensive maritime environments.

At the organizational level, learning culture, innovation orientation, and supportive leadership form the cultural backbone of a successful transition to Industry 5.0. Organizations that cultivate shared values, encourage professional development, and institutionalize knowledge-sharing practices demonstrate higher resilience, stronger adaptive capacity, and greater readiness for digital transformation.

At the educational level, the findings confirm that modernized training - combining technical expertise with leadership development, organizational-behavioural knowledge, and intercultural competence - is fundamental for preparing future specialists capable of operating within the human-centric logic of Industry 5.0.

Integrated Interpretation

Together, these four levels form a cumulative mechanism of influence:

- **Individual competencies** achieve their full potential only when embedded in **effective, trust-based teams**.
- **Team effectiveness** strengthens and transmits the norms of a **resilient and learning-oriented organizational culture**.
- **Organizational culture**, in turn, is reproduced, expanded, and renewed through **contemporary educational systems** that cultivate human-centric thinking.
- **Education** becomes the starting point for the next cycle of professional growth, leadership readiness, and cultural transformation.

In this way, the results confirm a dynamic, mutually reinforcing system in which the human factor serves as the central integrator of adaptation to Industry 5.0.

A more detailed interpretation of these relationships-and their implications for leadership, organizational design, and human-centered transformation-is presented in subsection **3.3 "Discussion of Findings and Conclusions."**

3.2.2. Validation of the Main Research Hypothesis (H_0)

The central research hypothesis (H_0) states that:

> *The adaptation of the maritime transport sector to the challenges of Industry 5.0 depends fundamentally on the human factor, expressed through leadership, soft skills, team dynamics, organizational culture, and educational preparation.*

To empirically test this assumption, the study applied the earlier methodological framework and constructed **four composite indices**, each representing a higher-order latent construct. These indices synthesize conceptually related variables and capture the multidimensional nature of the human factor across the four analytical levels:

- **Individual Level Index** – leadership, soft skills, adaptability, and technological readiness;
- **Team Level Index** – communication, trust, conflict management, and leadership support;
- **Organizational Level Index** – learning culture, innovation orientation, sustainability, and supportive leadership;
- **Educational Level Index** – curriculum innovation, leadership integration, organizational-behavioural education, and intercultural preparation.

The central hypothesis (H_0) is evaluated using an **integrative multiple regression model** that examines the combined influence of these four indices on the overarching indicator of **adaptation to Industry 5.0**.

This approach enables a holistic assessment of how the human factor - in its individual, social, cultural, and educational dimensions - contributes to the sector's capacity to transition toward a human-centric industrial paradigm.

▪ Conceptual Indices Used to Validate H_0

Based on the theoretical framework and the conducted empirical analyses, the following composite indices were defined:

H_1 – Individual Readiness & Adaptation Index

Includes the variables: soft skills, leadership, technological readiness, stress resilience, professional effectiveness, and adaptation.

The focus is on individual competencies, the capacity to cope with change, and personal readiness to operate in a modern technological environment.

H_2 – Team Dynamics & Trust Index

Includes communication, trust, conflict management, leadership, and team effectiveness.

This index reflects the quality of team interaction, the level of trust, and the effectiveness of teamwork in multicultural and high-risk contexts.

H_3 – Organizational Culture & Change Readiness Index

Includes learning culture, innovation culture, sustainability culture, leadership support, and successful transition.

It measures organizational maturity, learning culture, innovation capacity, and leadership support - key elements for a successful transition to Industry 5.0.

H_4 – Educational Innovation & Leadership Development Index

Includes curriculum innovation, leadership integration, intercultural education, organizational behavior education, and future leadership readiness.

This index evaluates the educational system's contribution to the development of competent, adaptive future leaders.

▪ Formal Specification of the Integrative Model (H_0)

The multiple linear regression model applied to test H_0 includes the four index predictors:

$$Y = \beta 0 + \beta 1 \cdot H1 + \beta 2 \cdot H2 + \beta 3 \cdot H3 + \beta 4 \cdot H4 + \varepsilon$$

Table 3. 9 Multiple Linear Regression Results for H_0

Index	β (coef.)	t	p	Significance
H_1 – Individual Readiness & Adaptation Index	0.41	6.28	< 0.001	***
H_2 – Team Dynamics & Trust Index	0.27	4.71	< 0.01	**
H_3 – Organizational Culture & Change Readiness Index	0.22	3.96	< 0.01	**
H_4 – Educational Innovation & Leadership Development Index	0.19	3.12	< 0.05	*

R^2 = 0.82

Adjusted R^2 = 0.80

F(4,45) = 47.89, p < 0.001

▪ Interpretation of the Results

The findings clearly demonstrate that **the human factor is a core mechanism for adaptation to Industry 5.0** in the maritime transport sector. All predictors included in the integrative regression model are statistically significant, highlighting their essential contribution to the overall Human Factor Model.

H_1 – Individual Index (β = 0.41)

This is the strongest predictor. Leadership capacity, soft skills, technological readiness, and stress resilience substantially influence maritime professionals' ability to perform effectively in an increasingly digitalized and cognitively demanding environment.

H_2 – Team Index (β = 0.27)

Effective communication, trust, and competent conflict management significantly enhance collective functioning - a critical requirement in operational settings characterized by high risk, multicultural composition, and rapid decision-making.

H_3 – Organizational Index (β = 0.22)

A culture grounded in learning, innovation, and sustainability provides the structural context through which individual and team resources are transformed into concrete behavioural patterns and measurable performance outcomes.

H_4 – Educational Index (β = 0.19)

Curriculum innovation, leadership integration, and interdisciplinary preparation positively influence leadership maturity and readiness for change. Although the impact is more moderate compared to individual and team factors, it remains essential for long-term competence development and sector-wide transformation.

▪ Summary and Acceptance of the Main Hypothesis

The integrative regression model explains **82% of the variance** in adaptation to Industry 5.0-an exceptionally high level of explanatory power for behavioural and organizational research.

The statistical significance of all predictors ($p < 0.05$) confirms that **the human factor is not an accompanying element, but the central driver** of transformation in the maritime transport sector.

On this basis, the central research hypothesis (H_0) is **accepted**:

> *The degree of adaptation of the maritime transport sector to Industry 5.0 is a function of the human factor, expressed through key competencies, leadership abilities, a learning-oriented organizational culture, and modern educational preparation.*

The model formula can be expressed as follows:

$$Y = 0.41 \cdot H1 + 0.27 \cdot H2 + 0.22 \cdot H3 + 0.19 \cdot H4 + \varepsilon$$

▪ Conclusion on the Validation of the Main Hypothesis (H_0)

The integrative analysis fully confirms the central research hypothesis: **the degree of adaptation of the maritime transport sector to Industry 5.0 is determined by the human factor, as reflected in key competencies, leadership abilities, a learning-oriented organizational culture, and modern educational preparation.**

The four composite indices - individual, team, organizational, and educational - form a **mutually reinforcing system** that shapes the capacity of maritime professionals to function effectively in an environment increasingly defined by automation, artificial intelligence, and digitalization.

The results demonstrate that the human factor does not operate in a linear or isolated manner, but rather through **interconnected levels of influence**:

- **Individual competencies** provide the baseline for professional readiness and adaptability.
- **Team functioning** shapes operational effectiveness, coordination, and decision-making.
- **Organizational culture** transforms individual capabilities into sustainable practices and long-term innovations.
- **Education** equips future specialists with the strategic mindset needed to navigate the human–technology interface of Industry 5.0.

This multi-level structure clearly shows that **technological innovations by themselves are not sufficient** to secure a successful transition to Industry 5.0. Their full impact is realized only when they are embedded within an environment enriched by strong human competencies, effective teams, supportive organizational mechanisms, and contemporary educational models. This constitutes the central argument validating the main hypothesis.

Accordingly, the human factor emerges as **the primary strategic resource** of the transformation process. Investments in training, leadership development, team effectiveness, and organizational learning are more decisive in determining adaptation to Industry 5.0 than technological infrastructure alone.

The central research hypothesis (H_0) is therefore **entirely accepted**:

> *The degree of adaptation of the maritime transport sector to Industry 5.0 is a function of the human factor, expressed through key competencies, leadership abilities, a learning-oriented organizational culture, and modern educational preparation.*

This conclusion provides the conceptual foundation for **Chapter 4**, where the applied ***Hybrid Human Factor Model for Industry 5.0*** is constructed.

3.2.3. Integrative Empirical Model of the Human Factor in Industry 5.0

Based on the regression analyses, correlation patterns, and the synthesized findings from the four analytical levels, the **Integrative Empirical Model of the Human Factor in Industry 5.0** (Figure 3.14) has been developed.

This model unifies the individual, team, organizational, and educational dimensions into a single conceptual framework that explains the mechanisms by which the maritime transport sector adapts to Industry 5.0 requirements. It illustrates how human-centric variables operate jointly-not in isolation-to generate greater adaptability, professional effectiveness, and leadership readiness.

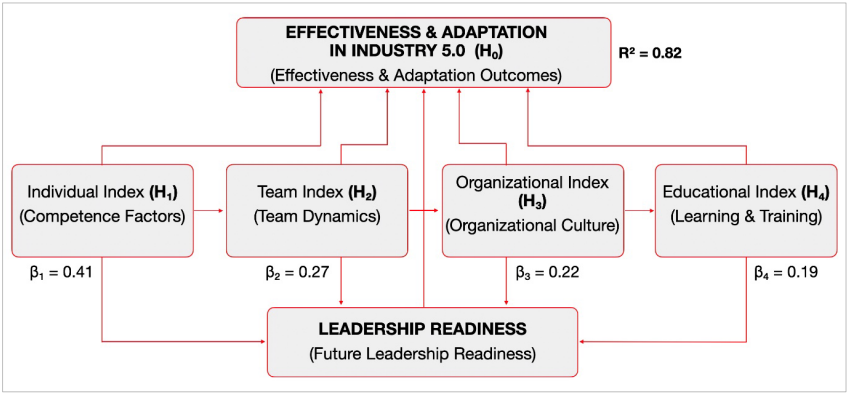

Figure 3. 14 Integrative Empirical Model of the Human Factor in Industry 5.0 – The Influence of the Four Indices on Leadership Readiness and Organizational Effectiveness in Industry 5.0

The model presents two central adaptation outcomes:

Effectiveness & Adaptation (EA) and Future Leadership Readiness (FLR).

Both outcomes are conceptualized as functions of the four composite indices (H_1–H_4), thereby visualizing the whole pathway of human-factor influence:

From **individual competencies**, through **team dynamics** and **organizational culture**, to the **educational environment** that shapes the next generation of maritime professionals and leaders.

The empirical results demonstrate that all four indices act as statistically significant predictors (β = 0.19–0.41) and exhibit moderate to strong correlations with the outcome variables (r = 0.57–0.65). These findings confirm that their effects are neither random nor independent but form an integrated structure of human interactions within the maritime professional environment.

Individual Index (H_1)

This index exerts the most decisive influence (β_1 = 0.41) and shows one of the highest correlations (r ≈ 0.63). It underscores the decisive importance of leadership skills, socio-emotional intelligence, technological readiness, and stress resilience in the context of

digitalization and automation. Individual competencies serve as the initial catalyst of adaptation to Industry 5.0.

Team Index (H_2)

The team dimension shows a moderate yet stable effect ($\beta_2 = 0.27$; $r \approx 0.59$). It confirms that trust, communication, and intercultural competence enhance the adaptive capacity of teams and individuals. This level bridges personal capabilities and organizational outcomes, reducing the likelihood of operational errors, misunderstandings, and conflict.

Organizational Index (H_3)

This index contributes significantly ($\beta_3 = 0.22$; $r \approx 0.57$), demonstrating that learning culture, sustainability, innovation climate, and leadership support function as core systemic enablers of organizational transformation. Organizational culture acts as a multiplier of both individual and team resources during the transition to Industry 5.0.

Educational Index (H_4)

The educational dimension also has a statistically significant effect ($\beta_4 = 0.19$) and shows the strongest correlation among all predictors ($r \approx 0.65$). It influences adaptation and, most importantly, shapes **Future Leadership Readiness**, ensuring that professionals acquire the behavioral, analytical, and socio-emotional competencies required to work within digitally intelligent and autonomous systems.

Explanatory Power of the Model

Together, these four dimensions explain **82% of the variance** in overall adaptation outcomes ($R^2 = 0.82$)-an exceptionally high value that strongly supports the central hypothesis (H_0). The findings confirm that adaptation to Industry 5.0 is **fundamentally a human-centric process**, in which competencies, values, and organizational culture determine the success of technological transformation.

Bidirectional Logic of the Model

The visual representation of the model illustrates a dynamic, bidirectional structure:

- The four indices **directly influence** both outcome variables - Effectiveness & Adaptation (EA) and Future Leadership Readiness (FLR).
- Leadership readiness (**FLR**) also strengthens individual, team, and organizational effectiveness, completing the **developmental cycle of the human factor** in Industry 5.0.

In this way, the model captures the whole logic of human-centric transformation:

From competencies → to culture → to leadership → and back into enhanced performance and readiness for future challenges.

▪ Distinction Between the Integrative Empirical Model (Chapter 3) and the Hybrid Human Factor Model for Industry 5.0 (Chapter 4)

It is essential to highlight the conceptual distinction between the **Integrative Empirical Model** developed in this chapter and the **Hybrid Human Factor Model** presented in Chapter 4.

The model in **Chapter 3** is **analytical and diagnostic**, constructed through statistical procedures that empirically validate the hypotheses and reveal measurable relationships among the four levels of the human factor. Its purpose is to demonstrate *how* individual, team, organizational, and educational variables interact empirically within the maritime transport sector.

In contrast, the model in **Chapter 4** is **conceptual and applied**. It builds upon the empirical foundation of Chapter 3 and integrates theoretical principles, practical mechanisms, leadership philosophies, and developmental strategies into a unified, actionable framework. While Chapter 3 answers the question *"What relationships exist?"*, Chapter 4 addresses *"How can these relationships be transformed into practice?"*.

Thus, Chapter 3 concludes the empirical verification phase of the study. In contrast, Chapter 4 begins the transformation of these findings into a practical human-centric model designed to guide organizational development, training strategies, and leadership formation in the maritime transport sector.

3.3. Discussion of Findings and Conclusions

The empirical results reveal a coherent, interconnected system of relationships that confirms the central role of the human factor in adaptation to Industry 5.0. The four composite indices - individual, team, organizational, and educational - operate simultaneously as autonomous elements and as mutually reinforcing components of a broader adaptive mechanism. Together, they form a comprehensive model of behavioral, cultural, and organizational transformation.

This section situates the empirical findings within a wider scientific and practical context. It examines three core aspects:

1. The extent to which the results confirm theoretical expectations derived from the literature on organizational behavior, leadership, and Industry 5.0.

2. The newly emerging interdependencies revealed through empirical analysis - relationships that extend beyond the initial assumptions and deepen understanding of the human factor.

3. The implications for management, leadership development, and educational policy in the maritime transport sector are outlined, with examples of how the findings can inform practical decision-making.

In this way, the discussion provides a smooth, logical transition from statistical outcomes to conceptual interpretation, preparing the ground for the applied model developed in Chapter 4.

- **Comparison Between Expected and Empirically Established Results**

Table 3.10: Comparison Between the Empirical Results and the Initially Expected Relationships

Table 3. 10 Comparison Between the Empirical Results and the Initially Expected Relationships

Hypothesis	Domain	Results	Evaluation Against Expectations
H_0	Integrated human factor (individual, team, organizational, and educational level)	The model demonstrates very high integrated explanatory power – $R^2 = 0.82$; all indices are statistically significant (β = 0.19–0.41)	Fully aligned with expectations, even slightly above (the model shows strong integrative power)
H_1	Individual skills	Strongest domain, high β	Higher than expected
H_2	Team communication and trust	β ≈ 0.50 / 0.46	Significantly higher than expected
H_3	Learning culture and sustainability	β ≈ 0.78–0.81	Far above expectations
H_4	Education	β ≈ 0.19; internal β = 0.54–0.56	Within expected range

3.3.1. What This Study Confirms and What It Changes in the Theoretical Framework

The empirical results not only confirm the main theoretical expectations outlined in Chapter 1 but also refine, expand, and in some areas adjust them. This allows for a more precise delineation of the role of the human factor in the context of Industry 5.0 and highlights several scientific relationships that earlier models did not sufficiently capture.

- **Empirically Confirmed Relationships Within the Study**

The human factor is the primary driver of transformation (confirmed).

The assumption that Industry 5.0 is a human-centric paradigm is strongly validated. All four domains - individual, team, organizational, and educational - show statistical significance and high explanatory power ($R^2 = 0.82$). This confirms that technological modernization succeeds only when embedded in strong human competence and a robust culture of interaction.

Soft skills and leadership are strategic competencies (confirmed).

The expected centrality of socio-emotional and leadership skills in the maritime sector is fully supported. The individual index is the strongest predictor (β = 0.41), confirming that human behavior and leadership qualities lie at the core of effectiveness.

Team dynamics are decisive in multicultural environments (confirmed).

The anticipated importance of communication, trust, and conflict management is empirically validated. The team index (β = 0.27) and strong correlations (r = 0.59–0.74) show that individual competencies translate into results only within a well-functioning team structure.

Organizational culture is a structural prerequisite for transformation (confirmed).

Learning-oriented and innovation-driven cultural models are supported by the data, with significant β-values (0.22–0.81). Culture clearly acts as the systemic mechanism through which human capabilities are converted into sustainable practices.

- ## How the Study Refines and Expands the Theoretical Framework

The role of education is stronger than anticipated.

Although theory predicted a moderate educational effect, the empirical results show high correlations (r = 0.65–0.74) and substantial β-coefficients (0.19–0.56). This elevates education from a supporting element to a strategic driver of leadership readiness.

The individual level exerts greater influence than conceptually assumed.

While theory suggested a balanced distribution of effects, the empirical model shows a clear dominance of individual competencies (β = 0.41). This shifts emphasis toward personalized development, psychological resilience, and cognitive flexibility.

Leadership readiness functions as an intermediary mechanism (new insight).

A new theoretical dependency emerges: leadership readiness is not merely an outcome but also reinforces adaptability and organizational effectiveness. This bidirectional effect was not foreseen and enriches the theoretical understanding of the human factor.

The impact of sustainability culture is stronger than expected.

In the theoretical framework, sustainability had a secondary role, yet empirically it exhibits one of the highest effects at the organizational level (β = 0.81). This expands the theory, showing that sustainability is not only an environmental ideal but a core mechanism of organizational adaptation to Industry 5.0.

- ## Contribution of the Study to the Advancement of Existing Models

1. **Introduces four composite indices as higher-order latent structures.**

These indices provide a more coherent, multidimensional representation of the human factor at the individual, team, organizational, and educational levels.

2. **Develops a dual-outcome model - EA and FLR - absent from previous frameworks.**

The distinction between *Effectiveness & Adaptation* (EA) and *Future Leadership Readiness* (FLR) expands the analytical capacity of existing models and highlights the dual nature of human-factor outcomes in Industry 5.0.

3. **Demonstrates the interconnectedness of four levels of the human factor within a unified model (R^2 = 0.82).**

This integrative structure empirically confirms the systemic interaction between competencies, team dynamics, culture, and education, offering one of the strongest explanatory models in current maritime-related research.

4. **Introduces the conceptual role of leadership readiness as an intermediary mechanism.**

The study reveals that leadership readiness not only emerges as an outcome but also reinforces adaptability and organizational effectiveness-a relationship not identified in earlier theoretical frameworks.

5. **Uncovers the interaction between the educational system and organizational culture.**

This relationship, rarely examined in the maritime sector, shows that educational practices directly shape cultural mechanisms and indirectly influence organizational adaptability.

This section provides a clear answer to what the study confirms and what it reshapes within the theoretical landscape. While the findings validate the core theoretical assumption of human-centricity, they also broaden understanding of the roles of education, leadership readiness, and sustainability as structural mechanisms driving the maritime transport sector's adaptation to Industry 5.0.

In this way, Chapter 3 not only confirms existing theoretical propositions but also enriches them with new empirical relationships that form the foundation of the Hybrid Human Factor Model developed in Chapter 4.

3.3.2. New Scientific Relationships Identified in the Analysis

The empirical analysis reveals several relationships that substantially extend the initial theoretical framework and introduce new mechanisms for explaining the role of the human factor in adaptation to Industry 5.0.

First, *leadership readiness (FLR)* emerges not only as an outcome variable but also as a mediating and amplifying mechanism. It links individual competencies with organizational outcomes, translates educational effects into behavioural patterns, and strengthens adaptation to technological and structural change - a function not anticipated in the original theoretical framework.

Second, the influence of the *individual domain* is significantly stronger than expected. With the highest regression coefficient ($\beta = 0.41$) and stable correlations ($r \approx 0.63$), it demonstrates that adaptation in a highly digitalized environment begins with individual flexibility - cognitive, socio-emotional, technological, and behavioural. This positions individual competencies at the centre of the system.

Third, the *educational domain* plays a much more strategic role than theoretically predicted. With the highest correlation to strategic outcomes ($r \approx 0.65$) and a stable effect on leadership readiness ($\beta = 0.19$), it emerges as a long-term transformational mechanism rather than a supplementary factor.

Fourth, *team dynamics* function as a structural bridge between the individual and organizational levels. High-quality communication, trust, and intercultural sensitivity enable individual skills to be expressed more fully while simultaneously reducing organizational risks.

Fifth, *organizational culture* acts as an active multiplier of human potential. It amplifies individual competencies, stabilizes team processes, and reinforces organizational resilience, with a learning-and-innovation culture emerging as a key strategic determinant.

Sixth, the findings show that the four domains operate as a *synergistic system*:

- Individual skills are practical only within strong teams.
- Team performance depends on organizational culture.
- Culture is reproduced through educational practices.
- Education strengthens leadership readiness, which in turn influences operational effectiveness.

Seventh, the study identifies a *dual-outcome architecture* in which the human factor affects both immediate operational results (Effectiveness & Adaptation - EA) and long-term development outcomes (Future Leadership Readiness - FLR). This two-level structure does not appear in earlier models.

Finally, the exceptionally high explanatory power of the integrative model ($R^2 = 0.82$) provides strong empirical evidence of the system's internal consistency. It confirms the centrality of the human factor in the transition to Industry 5.0.

3.3.3. Practical Implications for Management, Leadership, and Education in Maritime Transport

The empirical findings reveal a coherent logic of influence that carries direct practical relevance for organisations, teams, and educational institutions across the maritime transport sector. This section translates the identified scientific relationships into actionable guidelines, drawing on the four domains of the human factor - individual, team, organisational, and educational.

- **Implications for Management in Maritime Transport**

Transition toward human-centric management in complex operational environments

The results confirm that a culture of learning, trust, and psychological safety (H_3) is a leading predictor of successful adaptation to Industry 5.0. For ports, shipping companies, logistics operators, and cruise organisations, this implies a shift toward a human-centric management approach grounded in dialogue, continuous two-way feedback, and an environment where employees can safely report risks, errors, and training needs.

Such practices are essential in large, diverse operational settings where coordination and safety depend on clear communication and shared responsibility.

Integrated management of multicultural teams

The findings tied to H_2 emphasise that multicultural teams - both onboard and shore-based - require an integrated approach to collaboration. Trust, coordination, and intercultural sensitivity are decisive for the effectiveness of cargo handling, cruise operations, vessel navigation, and port logistics.

This demands systematic development of teamwork skills, training in conflict resolution, and mechanisms that build mutual support, particularly in time-critical or high-pressure operational contexts.

Managing through a culture of learning rather than procedures

The study shows that a traditional, procedure-driven model is insufficient in the context of Industry 5.0. A learning-oriented culture functions as a systemic protective mechanism, reducing stress, errors, and operational failures.

This requires organisations to:

develop internal training programmes,

strengthen teams' self-reflection and problem-solving abilities,

establish sustainable channels for intergenerational knowledge exchange.

Such practices enhance organisational resilience and sector-wide adaptability within the evolving technological landscape.

▪ Implications for Leadership

A new leadership profile for Industry 5.0

The dominant effect of the individual domain (H_1) underscores the need for a new type of leader in maritime transport. The contemporary maritime leader must combine:

- digital and data-driven competencies,
- emotional intelligence,
- the ability to motivate multicultural and geographically distributed teams,
- capabilities for stress management, adaptability, and change navigation.

This transforms the leadership role from a traditional hierarchical authority into that of a facilitator and coach who builds trust, coordinates complex human interactions, and maintains cohesion under uncertainty.

Leadership readiness as a strategic organisational resource

The identified reciprocal relationship between leadership readiness (FLR) and organisational adaptation reveals that leadership development must be treated as a strategic investment.

Organisations across the sector - shipping companies, port authorities, logistics operators, agencies, and educational institutions - should:

- systematically identify emerging leaders,
- implement structured leadership-development pathways,
- ensure continuity in leadership preparation through mentorship and succession planning,
- Embed leadership education into early-career training.

Such practices strengthen long-term organisational stability and prepare the sector for the demands of Industry 5.0.

- **Implications for Education and Professional Training**

Modernisation of curriculum content

The significance of the educational domain (H_4) highlights the need to modernise curriculum content by integrating technical and behavioural competencies, applying simulations and VR/AR technologies, and incorporating training grounded in real operational scenarios. Equally important is the development of multidisciplinarity across management, communication, and technology-related subjects - a key priority for maritime academies, universities, and professional qualification centres.

Training is a long-term investment in sector resilience

Education should be regarded as a long-term investment in the resilience of the maritime sector. It must prepare not only operational specialists but also future leaders through the early introduction of leadership programmes, the integration of organisational behaviour, cultural intelligence, and risk management, and practical training that closely mirrors real operational conditions.

- **Implications for Sectoral Policies**

The need for human-capital-oriented policies

The findings underline the need for policies centred on human capital development. This includes establishing systems for certifying soft skills and leadership competencies, standardising training for multicultural environments, and promoting sustained partnerships between industry and educational institutions.

Developing competency frameworks for Industry 5.0

At the same time, the sector must design competency frameworks that encompass digital skills, socio-psychological competencies, innovative thinking, adaptability, and resilience. Such frameworks will support coherent and up-to-date development across all subsectors - from ports and the cruise industry to operators, agencies, and logistics organisations.

Conclusions from the Empirical Chapter

The empirical investigation provides a comprehensive view of the mechanisms through which the human factor shapes adaptation to Industry 5.0 in the maritime transport sector. The analysis across the four domains - individual, team, organizational, and educational - reveals stable, interconnected, and statistically significant relationships that affirm the human-centric nature of this transformation.

The main conclusions are as follows:

1. **Individual competencies are the strongest predictor of adaptation to Industry 5.0.**

Leadership, socio-emotional skills, technological readiness, and psychological resilience emerge as decisive for professional effectiveness and readiness for change.

2. **Team dynamics serve an integrating function.**

Trust, communication, intercultural sensitivity, and constructive conflict management connect individual capabilities with organizational outcomes and stabilise behaviour in complex operational environments.

3. **Organizational culture is a strategic mechanism, not a passive backdrop.**

A culture of learning, innovation, and sustainability amplifies individual and team factors, translating them into durable practices and organizational maturity.

4. **Education plays a transformational - not merely preparatory - role.**

Modern interdisciplinary programmes in leadership, organizational behaviour, innovation, and intercultural communication cultivate competencies directly linked to leadership readiness and adaptability to Industry 5.0.

5. **The four domains form a synergistic system rather than independent predictors.**

Individual skills manifest fully only within effective teams; team effectiveness depends on organizational culture; and culture is reproduced through educational practices. This mutual reinforcement creates a complex adaptive mechanism.

6. **A two-level outcome model - operational (EA) and strategic (FLR) - is introduced.**

Adaptation encompasses not only current effectiveness but also the organisation's capacity to develop future leaders, adding a new vertical dimension to existing theoretical models.

7. **The model's explanatory power ($R^2 = 0.82$) is exceptionally high.**

This reflects the strong internal consistency of the human-factor system and its central role in the transition to Industry 5.0.

8. **The central hypothesis (H_0) is fully supported.**

The human factor is confirmed as the key determinant of successful transformation in maritime transport - both operationally and strategically.

The integrative regression model, explaining 82% of the variance, provides compelling evidence that the human factor is the central mechanism of transformation within the sector. This validates the primary hypothesis (H_0) and enriches the existing theoretical framework by identifying eight new scientific dependencies.

The empirical foundation established in this chapter forms the basis for Chapter 4, where these relationships are translated into an applied framework - **The Hybrid Human Factor Model for Industry 5.0**

CHAPTER IV
EDUCATIONAL STRATEGIES AND EXECUTIVE EDUCATION PROGRAMS

In the landscape of rapid technological evolution and profound social transformation, education is emerging as a strategic resource for developing human-centric organisations and sustainable leadership models. Within the Industry 5.0 paradigm, the focus shifts away from the mechanical acquisition of knowledge toward the cultivation of meta-competencies-critical and creative thinking, ethical responsibility, adaptability, and collective intelligence. This requires integrating academic scholarship, managerial practice, and technological innovation within a lifelong learning framework.

Executive Education programmes are becoming a key instrument in preparing visionary professionals in the maritime transport sector. They offer an environment for reflection and experiential learning in which practitioners strengthen their managerial capacity through a blend of knowledge, values, and self-awareness. In doing so, they support the human-centric transformation of their organisations.

This chapter presents **the Hybrid Human Factor Model for Industry 5.0** and its practical dimensions. The model systematises the interaction between the individual, the team, the organisation, the educational environment, and the technological context. The subsequent analysis examines how simulations, experiential learning methods, VR/AR technologies, and gamification foster leadership development, ethical awareness, and organisational learning in the maritime transport sector.

4.1. Conceptual Foundations and the Strategic Role of Executive Education

Executive Education refers to short-term, intensive, non-degree programmes designed for leaders and professionals who hold, or are preparing to hold, managerial positions (Amdam, 2020). In the contemporary context, such programmes extend far beyond traditional management preparation and increasingly serve as environments for cultivating meta-competencies: the ability to learn how to learn, to regulate emotions and behavioural responses, to create meaning in complex situations, and to integrate knowledge across disciplinary boundaries.

Within the global maritime industry, Executive Education functions as a critical mechanism linking academic insight, professional practice, and transformational leadership (Mintzberg, 2020; Ibarra & Scoular, 2022). It strengthens the understanding of the human factor, fosters trust-based organisational cultures, and enhances awareness of emotional and interpersonal dynamics within the maritime transport ecosystem.

In the era of Industry 5.0, Executive Education expands the boundaries of conventional managerial training through a human-centric, interdisciplinary, and experiential approach that leverages real-world scenarios enriched by advanced technologies. In doing so, it cultivates the central meta-competency of the maritime leader: the capacity to adapt, to guide change through meaning and dialogue, and to build a resilient and ethically grounded professional identity.

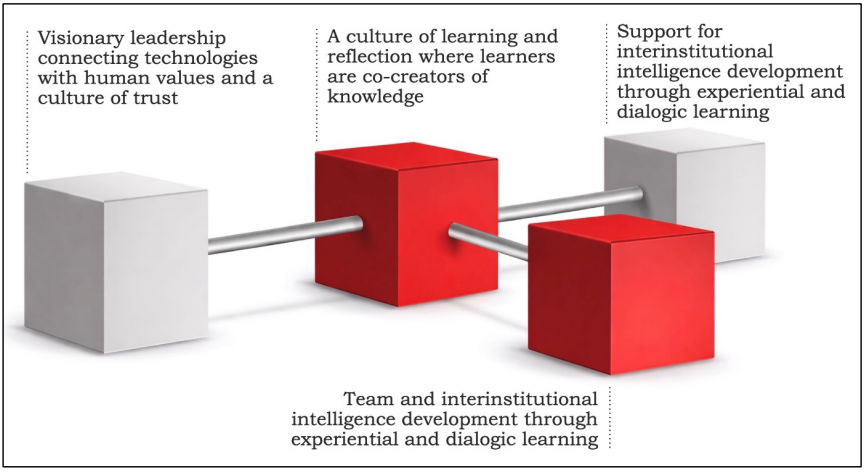

Figure 4. 1 Strategic Framework for Executive Education in Industry 5.0

The table reflects the human-centric paradigm of Industry 5.0 and highlights the role of Executive Education in developing visionary, team-oriented, and culturally intelligent leadership within the maritime transport sector.

Table 4. 1 Key Socio-Psychological and Organizational Areas of Executive Education in Maritime and inland waterway transport

Main Areas	Socio-Psychological and Organizational Essence in Water Transport
Visionary leadership that connects technologies with human values and a culture of trust	Development of key soft and organizational skills: leadership presence, decision-making under uncertainty, ethical and culturally sensitive communication, time and resource management, staff motivation and engagement. Emphasis on trust, psychological safety, and shared mental models in multicultural teams.
A culture of learning and reflection, in which learners are co-creators of knowledge	Experiential and dialogic learning through simulations, incident analysis, peer learning via exchange of professional experience, and digital learning technologies (VR/XR, AI). Development of communication skills, emotional and intercultural intelligence, conflict-management competencies, group dynamics, and self-organization under stress.
Development of team and inter-institutional intelligence	Building social, team, and organizational intelligence for coordination between ship crews, port authorities, agents, logistics operators, and maritime administrations. Strengthening cross-institutional communication, co-creation in decision-making, psychological safety, team resilience, and inter-institutional connectivity in the context of AI-supported systems.
Support for personal transformation – transition from expert to leader-facilitator	Development of psychological resilience, self-awareness, and stress management. Strengthening communication, emotional leadership, ethics and assertive behavior, mentoring, and a coaching approach. Use of AI tools and VR/XR technologies for reflective practice, decision-making under pressure, and multicultural team leadership.

The socio-psychological and organizational dimensions outlined here demonstrate that Executive Education in the era of Industry 5.0 extends far beyond the acquisition of techniques or familiarity with new technologies. It cultivates leaders capable of building trust, motivating diverse teams, making decisions in uncertain environments, and communicating effectively across multicultural environments. By employing innovative and experiential learning methods, Executive Education becomes a strategic instrument for sustainable, ethical, and safe sectoral development. It prepares managers to integrate the human factor, organizational dynamics, and technological transformation into a coherent, future-oriented leadership approach.

4.1.1. Architecture and Key Characteristics of Executive Education

In addition to the strategic framework, Figure 4.2 presents the architecture of Executive Education in the context of Industry 5.0, grounded in a systemic instructional design that develops higher-order managerial capabilities (meta-competencies). These capabilities are essential for decision-making under uncertainty, leading multicultural crews, and integrating the technological, social, and environmental parameters that shape contemporary maritime operations.

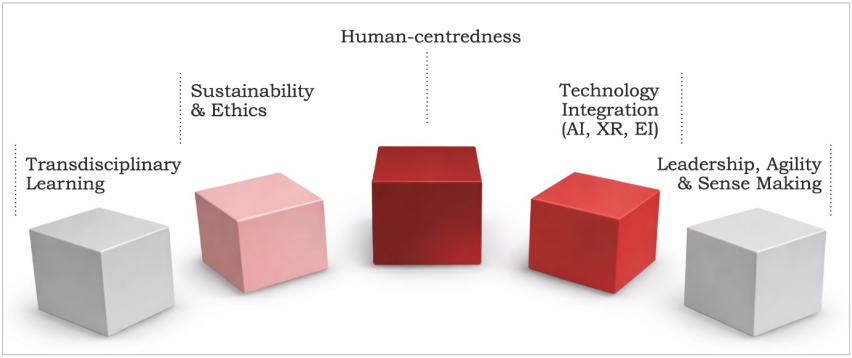

Figure 4. 2 Key Characteristics of Executive Education in the Context of Industry 5.0

Human-Centricity

Emphasises professional ethics, trust, and social responsibility. In the maritime context, this includes safe communication on the bridge and in the engine room, support for multicultural crews, and the prevention of psychosocial risks both onboard and ashore.

Integration of Technology and Emotional Intelligence (AI, XR, Big Data, EI)

Supports a digitally human-centred leadership profile capable of working with autonomous and semi-autonomous systems, analysing data in logistics and navigation processes, and transforming technological possibilities into meaningful managerial decisions.

Transdisciplinary Learning

Connects management, navigation, and engineering sciences, logistics, psychology, and intercultural communication. It is oriented toward generating solutions in an environment characterised by high technological, economic, and ecological interdependence.

Adaptive and Meaning-Making Leadership

Develops competencies for acting under uncertainty, managing emergencies and environmental incidents, interpreting complex situations, and formulating direction under ambiguous and dynamic conditions.

Sustainability and Ethics

Guides managerial decisions toward long-term ecological, social, and economic value aligned with the energy transition, maritime decarbonisation, and the development of "green" logistics corridors within the blue economy (Stefanova et al., 2025). Similar trends that combine sustainability with adaptation to economic challenges are identified in contemporary logistics literature, which emphasises the need for organisations to optimise processes and strategies in rapidly changing market environments (Stefanova, Kanev, & Agai, 2025).

The presented architecture of Executive Education can be systematised into core strategic goals and characteristics that unite technological innovation with the human factor and a culture of trust within maritime teams (Table 4.2).

Table 4. 2 Comparison Between the Strategic Goals and the Characteristics of Executive Education

Strategic Goals of Executive Education	Key Characteristics of Executive Education
Visionary leadership that connects technologies with human values and a culture of trust	Adaptive, meaning-making and ethical leadership integrating technological innovation with trust, psychological safety, and resilience in maritime teams.
A culture of learning and reflection, in which learners are co-creators of knowledge	Transdisciplinary and reflective learning based on experiential and dialogic approaches (experiential & dialogic learning), simulations, incident analysis, and the development of communication, emotional and intercultural intelligence (EQ/CQ).
Development of team and inter-institutional intelligence	Human-centric and socio-organizational intelligence supporting coordination among ship crews, port and administrative structures, logistics and technical operators; fostering cooperation, effective communication, and staff motivation.
Support for personal transformation – transition from expert to leader-facilitator	Integration of technological and emotional intelligence (AI, VR, big data) with soft skills, resilience, stress management, self-awareness, mentoring, coaching, and facilitation in team learning.

The presented goals and characteristics demonstrate that Executive Education functions not merely as a means of professional upskilling but as an environment for transforming leadership, organisational culture, and the socio-psychological patterns of interaction within the maritime industry.

4.1.2 Organisational Models and the Institutional Geography of Executive Education in Maritime Transport

The organisational model of Executive Education in maritime transport is grounded in the principles of flexibility, interactivity, and inter-institutional partnership. The educational ecosystem comprises universities and business schools, maritime academies, shipping and port companies, and international bodies such as IMO, EMSA, and HELMEPA. This collaborative structure enables the development of programmes based on real case studies, simulations, digital immersive environments, and hybrid learning formats.

Programmes are delivered through three main formats:

• **Short-term executive training**, designed for managers requiring rapid upskilling (e.g., crisis leadership, safety culture, ESG).

• **Certification programmes**, linked to measurable organisational transformation (e.g., leadership, digital transformation, sustainable management).

• **Academic–industry laboratories**, focused on simulations of navigational operations, logistics bottlenecks, decarbonisation, and digital solutions.

Leading institutions also offer long-term formats such as Executive MBA programmes, as well as specialised custom programmes tailored to the needs of specific organisations. Table 4.3 systematises the key programmes in maritime and inland waterway transport and highlights their human-centric and leadership orientation.

The institutional geography includes top global business schools (Harvard Business School, INSEAD, MIT Sloan, Oxford Saïd, IMD) and specialised centres within the maritime sector, such as the Rotterdam School of Management (RSM), Singapore Management University (SMU), the World Maritime University (WMU), and Copenhagen Business School (CBS). Detailed comparative data are provided in Appendices 1–3 (updated 2025).

Table 4. 3 Sample Executive Education Programs Focused on Socio-Psychological Skills and Leadership in the Maritime Environment

Program Type	Characteristics	Duration	Focus & Content	Example Maritime Context	Key Soft Skills Outcomes
Short Programs	Intensive training aimed at developing specific managerial and leadership skills	From several days to several weeks	Crisis leadership, team management, human factor and maritime safety, ESG standards	Maritime Crisis Leadership & Incident Management; Port Logistics & Terminal Operations	Decision-making under pressure, stress management, effective communication, team coordination, adaptability
Executive MBA / EMBA	Long-term program aimed at developing strategic and systemic thinking in the maritime industry	1–2 years	Strategic management, innovation, digital transformation, global maritime business	Global Maritime Leadership EMBA (CBS/ WMU/ RSM)	Strategic leadership, influence and persuasion, cultural intelligence, conflict management, organizational behavior and change
Custom Programs	Tailor-made and individualized programs developed according to the needs of a specific maritime organization	Flexible	Team management, safety culture, smart shipping, decarbonization, green maritime logistics	Decarbonization & Green Maritime Logistics; Safety Culture & Crew Performance Program	Coaching and mentoring, emotional resilience, communication, trust-building, team leadership on board

4.1.3. Contemporary Digital Tools for Socio-Psychological and AI-Supported Learning in Executive Education

In the context of the human-centric transformations associated with Industry 5.0, Executive Education in maritime transport is evolving into a psycho-technological environment for developing leadership, communication, and team competencies. Modern digital tools integrate adaptive platforms, artificial intelligence, sociometric analytics, biofeedback, and interactive media modules that support skills essential for safety, operational coordination, and maritime logistics (Sivkov, 2020; Mednikarov, Lutzkanova, & Chesnokova, 2022). These solutions reflect the understanding that effective learning is an experiential, reflective, and socially situated process (Kolb, 2014).

Within contemporary Executive Education programmes, gamification and game-informed learning are gaining prominence as mechanisms for engagement, adaptation to complexity, and maintaining motivation under conditions of informational and emotional strain. Classical authors in gamification design emphasise the value of game elements as structured environments for reflection, experimentation, and competence development. Karl M. Kapp (2012) demonstrates that gamified learning systems support behavioural modelling through real-time feedback, progressive challenges, and active interaction. Jane McGonigal (2011; 2015) and Watkins, Dickens, Elfman, & Green (2011) argue that game-based experiences foster psychological resilience, emotional engagement, and collective efficacy - qualities critical for leaders working in complex and high-risk maritime environments. These concepts shift the focus toward learning that is not only technologically innovative but also emotionally, socially, and motivationally enhanced by game mechanics and digital media environments.

AI-Supported Communication and Presentation Training

AI systems analyse speech characteristics - rhythm, tempo, pauses, and emotional cues - and guide for improving leadership presence and persuasive communication (Williamson, Macgilchrist & Potter, 2023). XR simulators featuring virtual audiences and digital media environments further support professionals who operate under high informational and emotional pressure (Dimitrakieva & Dimitrova, 2023).

Tools for Group Dynamics, Trust, and Team Coordination

Sociometric analysis systems reveal communication networks, cohesion, and latent coalitions - factors that influence safety and the distribution of leadership (Pentland, 2015). Measuring psychological safety (Edmondson, 2019) and collective efficacy (Carmeli & Schaubroeck, 2020) enables the design of training programs that reflect fundamental social dynamics within teams.

Biofeedback and Psychophysiological Regulation

Biofeedback tools monitor heart rate, heart-rate variability, and indicators of cognitive load, supporting self-regulation and situational awareness - competencies crucial in navigation, emergency response, and passenger-crisis management (Burke & Wilson, 2002).

Narrative and Reflective Digital Journals

AI-supported reflective journals facilitate leadership-identity development and critical self-reflection by identifying cognitive schemas, linguistic markers of stress, and ethical dilemmas.

Intercultural Communication and Mediation in Digital Environments

Tools for intercultural simulation and mediation, grounded in cultural scenarios and adaptive communication protocols, support interaction in multinational crews (Hofstede et al., 2010; Livermore, 2015).

Table 4. 4 Categories of Digital Tools and Key Socio-Psychological Effects

Category of Digital Tool	Examples	Main Effects on Learners
AI Speech Analysis & Public Speaking Coaching	AI speech coaches, XR media rooms	Persuasiveness, leadership presence, crisis briefings
Sociometrics & Team Dynamics	Digital sociograms, network mapping	Trust, coordination, psychological safety
Biofeedback & Cognitive Monitoring	HRV, stress indexes, attention tracking	Self-regulation, resilience, performance under pressure
Narrative / Reflective Journals	Audio/video journals, AI reflection prompts	Self-awareness, leadership identity
Intercultural Communication & Mediation	Digital role-play scenarios, cultural simulations	Adaptability, cultural intelligence, empathy

Taken together, these psycho-technological solutions are transforming the ways in which maritime organisations train leaders, collaborate, and make decisions under pressure (Lutzkanova, Mednikarov, Kalinov, & Stoyanov, 2024). They shape the conditions under which leadership increasingly emerges as a human-centric process grounded in trust, communication, self-regulation, and the capacity to navigate complexity.

Against this backdrop, the following subsection introduces the Hybrid Human Factor Model for Industry 5.0, which conceptually integrates these technological, socio-psychological, and organizational dynamics into a unified analytical framework.

4.2. The Hybrid Human Factor Model for Industry 5.0

Building on the empirical findings presented in Chapter III, **the Hybrid Human Factor Model for Industry 5.0** (Figure 4.3) integrates individual, team, organisational, and educational mechanisms that strengthen professional effectiveness and leadership readiness in the maritime transport sector. The model reflects the empirically validated conclusion that adaptation to Industry 5.0 is driven by the human factor - socio-emotional and leadership competencies, trust and coordination within teams, a learning-oriented organisational culture, and modernised educational preparation.

Its purpose is to offer a sustainable framework for sectoral transformation that consistently aligns technological advancement with humanistic values, ethical conduct, safety culture, and social responsibility.

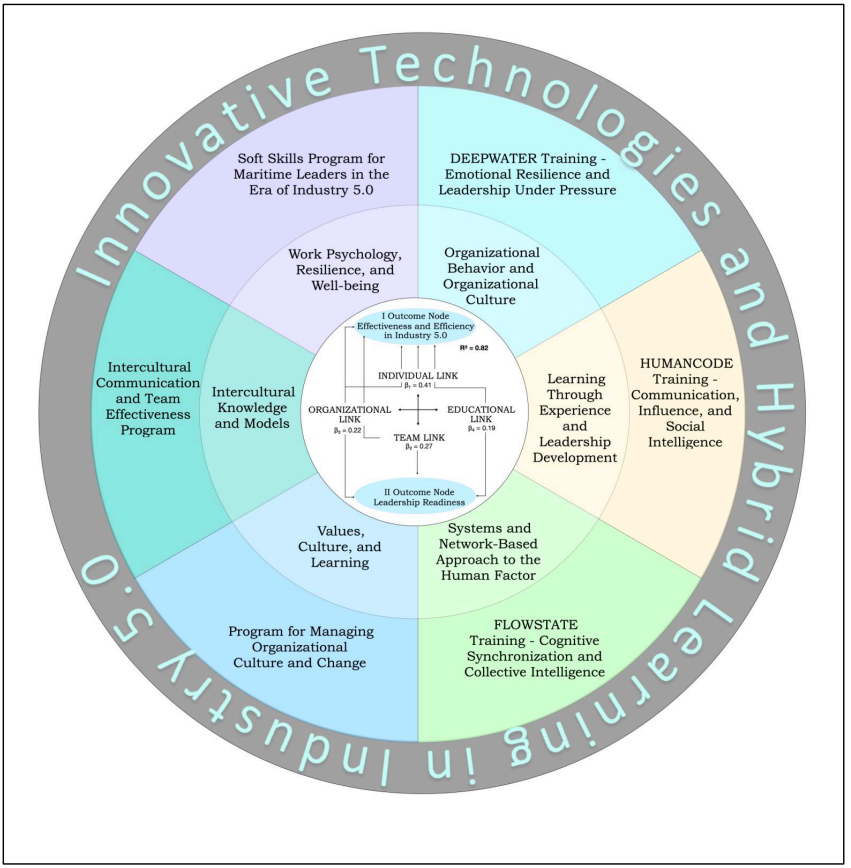

Figure 4. 3 The Hybrid Human Factor Model for Industry 5.0

The Hybrid Human Factor Model addresses a key challenge in contemporary waterborne transport services-the widening gap between rapid technological advancement and insufficient development of human capital. This misalignment often leads to errors, conflicts, inefficiencies, and reduced safety. By placing the human being at the centre of educational, managerial, and cultural processes, the model establishes the conditions for enhanced adaptability, more substantial team effectiveness, organisational resilience, and leadership readiness in complex, high-technology, and multicultural maritime environments.

4.2.1. Philosophical and Methodological Foundations of the Hybrid Model

The philosophical foundations of **The Hybrid Human Factor Model for Industry 5.0** affirm that technological advancement complements, rather than replacing, the human being as a bearer of values, knowledge, and responsibility. The human remains a co-creator of innovation and a guarantor of its ethical and social orientation. At the same time, knowledge is understood as a relational and experiential process shaped through the interaction between experience, community, and the technological environment.

Methodologically, the model integrates experimental, collaborative, and reflective learning, cultivating critical thinking, emotional intelligence, and leadership potential, and transforming learning into an interactive process of co-creating knowledge.

The theoretical framework draws on established scientific fields that support a humanistic and value-oriented approach:

1. **Organisational behaviour and leadership theories**, particularly humanistic and transformational perspectives, position the human as a source of value and resilience. In the maritime transport sector, this translates into leadership grounded in trust, psychological safety, and shared responsibility.
2. **Sociotechnical theories** emphasise the need for balanced development between technological systems and human capabilities - a critical requirement amid fleet digitalisation, automation, and the growing operational complexity of maritime work.
3. **The learning-organisation framework** (Senge, Argyris) provides a foundation for cultivating a culture of continuous learning, feedback, and shared knowledge - essential to maritime education and the preparation of future specialists in waterborne transport services.
4. **Humanistic and positive organisational theories** emphasise wellbeing, meaning, ethical responsibility, and sustainability as fundamental components of effectiveness.
5. **Social capital theory** highlights trust, cooperation, and cultural cohesion - critical factors in multicultural maritime teams.
6. **Experiential learning theory** (Kolb) offers a cyclical model of knowledge formation through concrete experience, reflection, conceptualisation, and active experimentation. It provides a methodological basis for the human-centric approach by recognising the active role of the learner and the transformation of experience into applicable knowledge - a key requirement in preparing maritime professionals for Industry 5.0.

The synthesis of these theoretical directions forms the conceptual foundation of **The Hybrid Human Factor Model for Industry 5.0**, in which the human factor is viewed as a strategic resource and a driver of sustainable development in the maritime transport industry. In this context, education becomes the primary catalyst for organisational adaptation, innovation, and long-term sustainability.

4.2.2. Structure, Functional Logic, and Contributions of the Hybrid Model

The model builds upon the Integrative Empirical Model by enriching its analytical dimensions with philosophical, methodological, and applied components. It incorporates four interconnected layers:

1. **Core of the Human Factor**,
2. **Theoretical Foundation**,
3. **Applied Competency Development Mechanism**, and
4. **Technological Infrastructure**, which integrates XR/VR simulations, digital learning environments, and organisational diagnostic tools.

Together, these layers form a comprehensive ecosystem for learning, leadership development, and organisational transformation.

To ensure clear continuity between the Integrative Empirical Model (Chapter III) and **the Hybrid Human Factor Model** presented in this chapter, **Table 4.5** outlines the correspondence between empirical relationships, theoretical refinement, and their applied transformation within the context of Industry 5.0.

Table 4. 5 Validation of the Integrative Empirical Model and Its Advancement into the Hybrid Human Factor Model in Industry 5.0

LEVEL (COMPONENT)	CONTENT	EMPIRICAL VALIDITY (FINDINGS)	INTEGRATION IN THE HYBRID MODEL
Integrative Empirical Model (Chapter 3) – predictors	Four human-factor indices: H_1 Individual Index – $\beta_1 = 0.41$; H_2 Team Index – $\beta_2 = 0.27$; H_3 Organizational Index – $\beta_3 = 0.22$; H_4 Educational Index – $\beta_4 = 0.19$	The model shows that the combination of H_1–H_4 explains a significant part of the variance in human-factor outcomes.	Serves as the structural basis for Layer 1 (Human Factor Core) in the Hybrid Model.
Integrative Empirical Model – outcomes	Two key outcome variables: H_0 Effectiveness and Adaptiveness in Industry 5.0 and Leadership Readiness	The model's total explained variance is $R^2 = 0.82$, confirming the high predictive value of the four indices H_1–H_4 for effectiveness, adaptiveness, and future leadership readiness.	Empirically validates that the human factor is a key adaptation mechanism in Industry 5.0 - this is the starting point for the conceptual development in Chapter 4.
Layer 1: Human Factor Core	Transfers the Integrative Empirical Model as the core of the Hybrid Framework: the four indices H_1–H_4, linked to the outcomes H_0 and leadership readiness.	Based directly on the empirical validation from Chapter 3 (β-coefficients and R^2).	Defines the human factor as the central predictor of effectiveness, adaptiveness, and leadership readiness; subsequent layers build upon it.
Layer 2: Theoretical Foundation	Integrates theories of human-centredness, learning organizations, social capital, collective intelligence, experiential learning (Kolb), and intercultural leadership.	Theoretically explains the relationships identified in Layer 1 and situates them within the socio-technological ecosystem of Industry 5.0.	Turns the empirical model into a conceptual philosophy for human-factor development.
Layer 3: Application Engine	Specific training and development interventions: coaching, facilitation, XR/VR simulations, team scenarios, Executive Education formats for maritime leaders and teams.	Practically validated through real training and organizational programs focused on improving H_0 and leadership readiness.	Operationalizes the relationships from Layer 1 and the principles of Layer 2 by developing sustainable competencies and leadership readiness.
Layer 4: Technology Infrastructure	AI, XR/VR/AR, digital twins, autonomous and cyber-physical systems, hybrid communication, real-time data.	Provides the technological environment that amplifies human-factor effects and supports high levels of effectiveness, adaptiveness, and safety.	Supports Layer 3 with technological enhancement, fully aligned with human-centred principles: technology augments, not replaces, the human factor.

LAYER 1: EMPIRICAL CORE OF THE HUMAN FACTOR IN INDUSTRY 5.0

Layer 1 constitutes the core of the hybrid conceptual framework and is grounded in the Integrative Empirical Model developed and validated in Chapter III. It integrates four interconnected nodes - individual, team, organisational, and educational - whose interactions are statistically confirmed through the bidirectional β-coefficients associated with hypotheses H_1–H_4.

The systemic effect of these interactions manifests in enhanced effectiveness, teamwork, adaptability, and leadership readiness, establishing the human factor as the primary adaptive mechanism in Industry 5.0.

This layer provides the empirical basis for the theoretical extension in Layer 2, the applied developmental mechanisms in Layer 3, and the technology-enabled transformation in Layer 4.

The **individual node** conceptualises the human factor as a dynamic adaptive system encompassing leadership, socio-emotional intelligence, technological readiness, and stress resilience. It determines an individual's capacity to engage with technological, social, and organisational environments and forms the foundation of adaptive readiness.

The **team node** views the team as a form of collective intelligence grounded in trust, open communication, shared leadership, and psychological safety. In this way, individual competencies are converted into operational effectiveness, particularly in multicultural and high-risk settings.

The **organisational node** integrates a culture of learning, innovation, sustainability, leadership support, and change-management mechanisms, forming a human-centric organisational architecture that transforms individual and team resources into sustainable practices and safe work systems.

The **educational node** functions as a systemic transformational mechanism that prepares future specialists for leadership through formal and postgraduate education, professional qualification formats, experiential and reflective learning, coaching, facilitated processes, and XR/VR simulations that enable competence development in controlled yet realistic environments. In this role, the node becomes a key bridge to the training programmes and Executive Education formats discussed in Chapter Five, where its transformational potential is operationalised.

The interaction among the four nodes produces a cumulative outcome characterised by higher effectiveness (reflected in increased productivity and operational reliability), strengthened teamwork (through collective intelligence and joint decision-making), enhanced adaptability to technologically dynamic environments, and leadership readiness, characterised by maturity in managing critical situations and organisational change.

Layer 2: Theoretical Foundation

Layer 2 represents the theoretical foundation of the Hybrid Human Factor Model and systematises the empirical relationships from Layer 1 into conceptual principles and regulatory norms that guide learning, organisational development, and technology-supported processes. This framework defines the core mechanisms for human-factor development-experiential learning, simulation-based training, coaching, reflection, and

collective decision-making-and provides the logical basis for their application in the subsequent layers.

The theoretical foundation is structured around five key conceptual domains:

1. Human-Centricity in Industry 5.0 – technology enhances human expertise and supports professional, ethical, and safety-critical decision-making.

2. Systems and Organisational Behaviour – the human factor is embedded within dynamic sociotechnical networks characterised by interdependence, synergy, and adaptability.

3. Learning Culture and Executive Education – competence is viewed as a continuous, developmental process driven by reflection, experiential enrichment, and structured knowledge transfer.

4. Collective Intelligence and Team Dynamics – teams operate as integrated cognitive systems for analysis, coordination, and decision-making, especially in high-risk and multicultural environments.

5. Intercultural and Ethical Leadership Framework – leadership is understood as sustainable, inclusive, and responsible, aligned with the values of the global maritime profession.

Layer 2 functions as a conceptual bridge between the empirical foundation of Layer 1 and the applied developmental mechanisms of Layer 3, providing the principles for designing training programmes, simulations, and organisational interventions. At the same time, it establishes the human-centric and ethical standards necessary for integrating AI-based tools, XR/VR simulations, and autonomous systems within Layer 4.

At its core, this theoretical layer transforms the Integrative Empirical Model into a coherent philosophy for developing the human factor in Industry 5.0, setting the norms and guiding logic that shape the hybrid framework as a whole.

LAYER 3: APPLIED MECHANISM

Layer 3 represents the *Applied Mechanism* of **the Hybrid Human Factor Model for Industry 5.0**, translating the theoretical principles from Layer 2 into concrete training, organisational, and simulation-based solutions for human-factor development. It functions as the operational engine of the model, enabling the core dimensions of Layer 1 to acquire practical relevance in real maritime and logistics environments.

The Applied Mechanism activates, reinforces, and transforms the human factor through targeted interventions that develop the individual, team, organisational, and educational nodes of Layer 1. This is achieved through experiential learning, advanced simulation methods, coaching, facilitation, intercultural training environments, and digital learning platforms that support continuous professional development and adaptive decision-making under pressure. In this regard, Layer 3 is a critical transition point where a conceptual model becomes a set of implementable solutions, including specialised maritime programmes and Executive Education formats.

The Applied Mechanism comprises an integrated toolkit of learning approaches - experiential and reflective learning cycles, XR/VR/AR simulations for high-stakes

operational decisions, individual and group coaching, mentoring, team facilitation, and intercultural or collective-intelligence training modules. Through these approaches, the empirical relationships identified in Layer 1 are translated into behavioural, cognitive, and leadership competencies needed for sustainable performance in technologically accelerated, unpredictable environments.

Layer 3 forms an organic link with the remaining layers of the model: it builds on the empirically validated nodes of Layer 1, operationalises the conceptual principles of Layer 2, and leverages the XR/VR systems, AI-supported tools, and hybrid communication infrastructures embedded in Layer 4 to create authentic, technology-enhanced learning settings.

In essence, the Applied Mechanism operationalises the theoretical principles of Layer 2 and converts the empirically validated relationships of Layer 1 into targeted training, simulation, and organisational development interventions. Through these processes, the human factor acquires sustainable competencies, adaptability, and leadership readiness aligned with the demands of Industry 5.0.

LAYER 4: TECHNOLOGICAL INFRASTRUCTURE

Layer 4 represents the *Technological Infrastructure* of **the Hybrid Human Factor Model for Industry 5.0** and provides the digital–operational environment necessary for the effective implementation of the training and organisational processes outlined in Layer 3. Its role is to support the human factor through intelligent, adaptive, and ethically aligned technological solutions that enhance learning, situational awareness, and decision-making in dynamic maritime and technical settings.

The technological infrastructure incorporates several key domains:

- **Artificial intelligence and machine learning** for risk assessment and decision support;
- **XR/VR/AR simulation environments** for training in critical and high-stakes scenarios;
- **Autonomous and cyber-physical systems** that maintain safe, efficient, and sustainable maritime operations;
- **Hybrid communication architectures** enabling coordination among geographically distributed teams;
- **Digital twins and real-time data ecosystems** that strengthen situational awareness, predictive maintenance, and operational foresight.

As a structural component of the model, Layer 4 reinforces the individual, team, organisational, and educational nodes of Layer 1 through technology-assisted adaptation. It operationalises the human-centric, ethical, and sustainability principles formulated in Layer 2, providing the technological environment within which Layer 3 implements its simulation scenarios, XR/VR learning modules, intelligent learning pathways, and hybrid training formats.

In essence, the Technological Infrastructure functions as an intelligent operational layer that enables the model's training and organisational mechanisms to develop the human

factor in alignment with Industry 5.0 requirements. It integrates AI, XR/VR technologies, autonomous systems, hybrid communication networks, and real-time data into a coherent ecosystem that augments human capabilities and reinforces their central role within complex maritime and technical environments.

Contributions and Practical Significance of the Hybrid Model

The developed Hybrid Human Factor Model for Industry 5.0 constitutes an original scientific contribution that translates the philosophy of human-centrism into a coherent managerial and pedagogical framework for the maritime transport sector. Building on the empirically validated relationships from Chapter Three, the Model embeds them into a broader system encompassing the individual, team, organisational, and educational levels, all situated within a contemporary technological environment.

Its scientific contribution lies in the conceptual integration of these five dimensions into a unified, networked structure that replaces traditional linear and hierarchical models of organisational behaviour with an ecosystem logic and socio-technological integration. Through this synthesis, the Model offers a new understanding of the human factor as a dynamic system shaped by the interactions among individuals, teams, organisations, learning processes, and the technological context.

The Model's practical contribution lies in its role as a methodological foundation for the development of Executive Education programmes and specialised training formats aligned with the principles of Industry 5.0 and the specific characteristics of the maritime domain. It can support the design of leadership development programmes, the strengthening of crew performance, the cultivation of organisational cultures rooted in trust, ethics, and collective intelligence, and the implementation of digital tools and VR/AR simulations within training processes.

Thus, the Hybrid Human Factor Model for Industry 5.0 combines scientific rigour, methodological coherence, and high practical applicability, becoming an instrument for transforming maritime organisations and educational institutions in line with the human-centred ethos of Industry 5.0.

Essential Contribution

The Hybrid Human Factor Model integrates the results of the theoretical analysis (Chapter One) and the empirical study (Chapter Three) into a unified systemic framework for organisational and educational development. Its originality is expressed through several core contributions:

- **From philosophy to applicability** – The Model translates the abstract notion of human-centrism into concrete organisational and pedagogical practices applicable in maritime universities and industry structures.
- **From the individual to the systemic level** – It links individual behaviour, team dynamics, organisational culture, educational policies, and the technological context into a single cycle of mutual learning, adaptation, and development.
- **From a static to an adaptive structure** – It conceptualises maritime organisations as open, self-renewing systems capable of learning and adapting through feedback, collaboration, and reflection.

- **From technological to ethical orientation** – It advances a new balance between digital innovation and humanistic values, positioning ethics, empathy, and social responsibility as strategic resources for sustainability and organisational stability.
- **From knowledge to meaning** – It reframes learning from a process of information transmission into one of meaning-making, leadership maturity, and the cultivation of a culture of trust.

In this way, the Hybrid Human Factor Model for Industry 5.0 represents a significant conceptual contribution to the theory of organisational behaviour and maritime education, as well as a methodological contribution that offers a practical framework for transforming training and management in alignment with the human-centred paradigm of Industry 5.0.

Key Findings

1. Human-centred organisational behaviour is a strategic resource.

It is not a "soft" or secondary domain but a core determinant of innovative, operational, and strategic success in the maritime sector. Organisations that cultivate empathy, trust, psychological safety, and shared-responsibility leadership exhibit higher adaptability, resilience, and operational safety.

2. Education is the engine of transformation.

Through curriculum modernisation, coaching, simulation-based formats, VR/AR environments, and Executive Education initiatives, maritime academies can prepare a new type of professional-ethical leaders, visionaries, and critical thinkers capable of functioning in multicultural, digitalised, and highly dynamic environments.

3. Technology is a partner, not a substitute for the human being.

Within Industry 5.0, technological systems augment human performance, strengthen cognitive and operational capacities, and ensure higher levels of safety and efficiency. Innovation arises not from automation alone but from the ethical and functional symbiosis between human intuition and technological precision.

4. Integration between industry and academia is a prerequisite for progress.

The model emphasises the bidirectional relationship between organisational practice and educational policy: industry formulates real competence needs, while academia generates the knowledge, skills, and conceptual frameworks that prepare leaders and reshape management paradigms, organisational cultures, and learning environments.

5. Ethical and social dimensions define sustainability.

Technological progress gains long-term value only when it serves the human being. Without ethics, trust, care for wellbeing, and collective responsibility, organisations remain vulnerable to risks, conflicts, and competence erosion. True sustainability is achieved when human values are structurally embedded in strategy, processes, and leadership decisions.

Significance for the Maritime Industry and the Academic Community

For the academic community

The model offers a theoretical and methodological basis for designing curricula, qualification programmes, and Executive Education pathways grounded in experiential, transformative, and reflective learning. It supports the modernisation of maritime education and its alignment with Industry 5.0 principles.

For maritime companies and port operators

The model provides tools for building organisational cultures rooted in trust, ethics, collective intelligence, and sustainable leadership. It supports the development of teams capable of operating effectively in complex, high-risk, and multicultural maritime contexts.

For researchers and policymakers

The model serves as a methodological foundation for analysing the human factor, social capital, and human–technology interaction in a rapidly digitalising environment. It outlines a conceptual framework for shaping policies in human resources, safety, sustainability, and education across the blue economy.

Overall Significance

The model reinforces the view that the sustainable future of the maritime industry rests not on technology alone, but on the human being who designs, operates, and directs it toward the common good. By combining scientific rigour, pedagogical innovation, and organisational applicability, the integrated model becomes a practical tool for modernising the sector-a blueprint for a learning, ethical, and human-centred maritime ecosystem aligned with the principles of Industry 5.0.

4.2.3. Expected Outcomes and Empirical Validation of the Hybrid Human Factor Model

The implementation of the Hybrid Human Factor Model in the maritime transport sector is expected to generate multidimensional outcomes-cognitive, behavioural, organisational, and societal. These results serve as key indicators of the effective functioning of the human-centric paradigm in Industry 5.0.

1. Individual Level

- Development of highly adaptable human capital equipped with critical thinking and strong ethical foundations;
- Formation of self-reflection and conscious leadership that integrates rational and emotional competencies;
- Increased motivation for lifelong learning and deeper integration of personal development into professional identity.

2. Team Level

- Creation of high-performing teams grounded in trust, mutual support, and shared responsibility;
- Improved communication culture in multicultural and technology-intensive environments;
- Enhanced synergy between human and technological intelligence during operational decision-making.

3. Organisational Level

- Establishment of learning and reflexive organisations capable of self-renewal and sustained knowledge exchange;
- Strengthening organisational ethics and social responsibility as a foundation for sustainable development;
- Optimised interaction between human resources and digital technologies, resulting in higher safety, efficiency, and innovation capacity.

4. Cross-Sectoral and Societal Level

- A stronger, more dynamic link between academia and the maritime industry through knowledge exchange, internships, and joint training programmes;
- Increased public trust in maritime institutions as ethical, sustainable, and socially responsible organisations;
- Contribution to the realisation of the European vision for sustainable and human-centred maritime ecosystems.

Building on the Hybrid Human Factor Model, Chapter Five introduces a practical framework for its implementation through simulations, VR/AR training scenarios, coaching models, and executive development formats tailored to the maritime sector. In this way, the conceptual system is transformed into an operational toolkit for the real-world development of the human factor.

Empirical Validation of the Hybrid Human Factor Model for Industry 5.0

The empirical validation of the **Hybrid Human Factor Model for Industry 5.0** is grounded in the quantitative findings presented in Chapter Three, which demonstrate statistically significant relationships between individual characteristics, team dynamics, organisational culture, and the overall effectiveness of the human factor in maritime practice. The identified correlations and regression effects confirm that human behaviour in environments of high technological and operational complexity is shaped by the interaction of the very factors integrated within the Model's conceptual structure.

According to the empirical results, resilience under pressure, trust, communication quality, and leadership readiness exhibit substantial predictive value for both team effectiveness and organisational adaptability. This validates the analytical logic of the **Hybrid Human Factor Model for Industry 5.0**, which conceptualises human-centric development as a systemic process unfolding simultaneously at the individual, team, organisational, and educational levels within a contemporary technological and sociotechnical context.

The empirical robustness of the model is further reinforced by the alignment between the identified needs of maritime professionals and its structural components, which direct attention to the targeted development of metacompetencies such as situational awareness, adaptability, critical thinking, intercultural sensitivity, and collective intelligence. This correspondence substantiates the model's application as a methodological foundation for Executive Education programmes, simulation-based learning environments, and VR/AR-enhanced developmental practices, as elaborated in Chapter Five.

Thus, the **Hybrid Human Factor Model for Industry 5.0** emerges as an empirically validated framework for analysing, predicting, and developing the human factor in the maritime industry, providing internal logical coherence, practical applicability, and strong scientific credibility.

4.3. Applied Dimensions of Human-Centric Learning in the Maritime and Inland Waterway Transport Sector: Simulations, VR/AR and Experiential Methods in Executive Education

This section operationalises the dependencies validated in Chapter Three between leadership, soft skills, organisational culture, and education, translating them into concrete pedagogical and technological practices. While the integrative model in Chapter Three demonstrates the statistical relationship between the human factor and adaptation to Industry 5.0, the focus here is on how these dependencies materialise within the educational environment-through experiential, simulation-based, and immersive learning.

4.3.1. From Classical Methodology to Experiential Knowledge

Kolb's (1984) model forms the foundation of simulation-based and XR-enabled learning, conceptualising learning as a process in which *"knowledge is created through the transformation of experience"* (p. 38). Its four-stage cycle-concrete experience, reflective observation, abstract conceptualisation, and active experimentation-explains why immersive methods (VR/AR, role-play scenarios, simulations) produce profound and lasting competence development. In the maritime and inland waterway transport sector, these formats allow professionals to rehearse leadership crises, emergency procedures, logistical disruptions, and interpersonal conflicts in a controlled yet realistic environment, activating the full learning cycle and ensuring high transfer to operational practice.

Within executive education, this results in more effective preparation for decision-making under pressure, crisis management, situational awareness, and leadership mediation in multicultural teams. Facilitated reflection following the experiential phase transforms individual experience into applicable organisational knowledge. As Kolb and Kolb (2017) emphasise, Experiential Learning Theory provides a comprehensive framework for enhancing learning and professional growth.

This paradigm is rooted in classical pedagogical traditions. John Dewey (1938) views knowledge as emerging from experience, reflection, and action, while Donald Schön

(1983) introduces the concept of the reflective practitioner-professionals who learn *in* and *through* action. In this perspective, the contemporary educator becomes a facilitator who supports the transformation of experience into understanding. Designing VR/AR sessions and simulations thus requires multidisciplinary collaboration among pedagogical, technological, and psychological experts, turning the learning environment into a space for dialogue and co-creation (Brookfield, 2017 Siemens, 2008). In Freire's (1970) logic, learning becomes a cooperative process in which educator and learner engage as partners.

This approach is particularly relevant to fields such as management, logistics, organisational behaviour, communication, and leadership-domains in which essential competencies cannot be mastered through lecturing alone. VR/AR and simulation methods enable safe rehearsal of organisational crises, ethical dilemmas, and interpersonal conflicts, positioning the learner as an active creator of knowledge rather than a passive recipient. Contemporary research confirms that interactive formats significantly enhance skill acquisition, underscoring the need for an academic culture oriented toward experimentation, reflection, and interdisciplinarity.

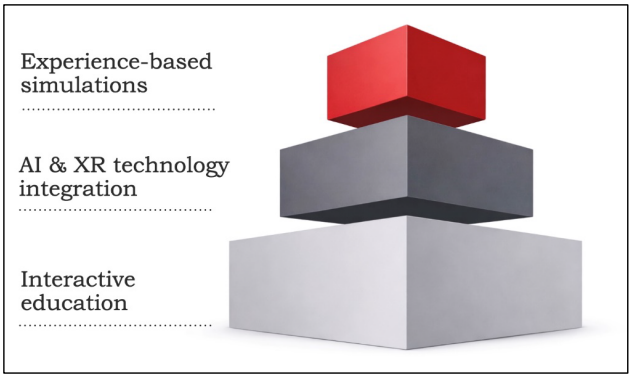

Figure 4. 4 The Evolution of Pedagogical Approaches in Maritime Transport Education

VR/AR environments and simulation-based learning are not merely technological enhancements but a methodological transformation. They integrate experience, meaning-making, and experimentation, creating conditions for the sustainable development of competencies aligned with the human-centric principles of Industry 5.0. Maritime universities are thus evolving into laboratories for innovation and human development, where learning is conceived as an ecosystem-simultaneously technological, ethical, and creative.

4.3.2. Immersive Technologies and Simulation-Based Training (VR/AR): From Environment to Impact

Immersive technologies-virtual reality (VR), augmented reality (AR), and extended reality (XR)-are transforming the design and experience of training in the maritime transport sector (Sotirov et al., 2025). They provide controlled, realistic, and repeatable

conditions for mastering complex tasks that would otherwise be difficult, costly, or hazardous to reproduce in real life-from emergency response and disaster coordination to crisis communication and leadership under pressure. The value of simulation-based training is further supported by studies showing that engine room simulators successfully prepare command staff for emergency and fire scenarios, enhancing situational awareness, coordination, and leadership responses under stress (Kalinov, Tsvetkov, & Bakalov, 2017).

According to data from Maersk Training (2024), VR trainees complete courses four times faster and maintain four times higher focus, while organisations report a 43% reduction in workplace incidents. PwC (2023) similarly notes that VR-based learning increases knowledge retention by 75% and boosts confidence in applying new skills in real operational settings by more than 40%.

VR is used not only for technical drills but also for developing socio-psychological competencies such as leadership, communication, stress management, situational awareness, and team coordination. Multi-user simulations enable role-based collaboration (e.g., captain–officer–helmsman) during emergency scenarios, supporting team effectiveness and collective decision-making.

A key stage in the evolution of training is the integration of artificial intelligence (AI) into simulation platforms. Intelligent virtual mentors and adaptive scenarios personalise the learning process by analysing behaviour, reaction speed, and cognitive patterns, and adjusting the content to individual learning styles (Koritarov & Dimitrakiev, 2025; Sivkov, 2022; Sotirov, Petrova, & Nikolova-Sotirova, 2024).

The Immersive Environment as a New Learning Reality

With adequate expertise and technological infrastructure, simulations enable training across diverse professional contexts without requiring physical presence in the actual environment. Instead of travelling to a vessel, port facility, or cruise operations centre, these settings can be recreated virtually within the university (Sivkov, 2022; Dimitrakiev, Stankov, & Atanasova, 2023).

Through VR/AR, the management of a cruise terminal, logistics hub, or bridge control room can be simulated with complete operational realism (Angelova & Belev, 2023). Instructors can introduce real-time changes-equipment malfunctions, shifting weather conditions, communication failures-and observe trainees' responses, integrating the subsequent debrief into the learning process (D'Augusta et al., 2024) .

Such training does more than replicate reality-it enhances it through immersion, interactivity, and emotional engagement, thereby strengthening retention and fostering critical thinking. According to data from the Antwerp Maritime Academy (2023), the use of VR simulators in safety and communication training reduces errors in performing standard operational procedures by 32%.

Human-Centric Dimension and Application in the Social Disciplines

Immersive technologies are particularly effective in human-oriented disciplines such as management, teamwork, organisational behaviour, leadership, communication, and crisis management. These areas require the development of behavioural and emotional competencies that cannot be acquired solely through theory.

Simulations enable the rehearsal of real-world scenarios, including:

• conflicts within shipboard teams;

• passenger-related crises on cruise vessels;

• logistical disruptions requiring rapid decision-making under stress;

• intercultural communication within multinational crews.

AI-enhanced VR systems can analyse non-verbal reactions, decision-making speed, and levels of collective synergy. These data offer a new perspective for assessing soft skills that have traditionally been difficult to measure empirically.

Proposal for Establishing an Immersive Learning Lab at the Nikola Vaptsarov Naval Academy

Въз Based on the presented analyses and international best practices, the creation of an **Immersive Learning Lab** at the NVNA is proposed. This multifunctional simulation environment would train both students in maritime and inland waterway transport programmes and industry professionals through executive-education formats.

Key features:

• A 360° projection system capable of recreating maritime, managerial, logistical, and communication scenarios;

• Integration with AI platforms for personalised feedback and behavioural analytics;

• Capability for blended learning (VR/AR + in-person facilitation + gamification);

• An interdisciplinary team comprising faculty members, IT specialists, psychologists, and experts in organisational behaviour, logistics, and student development.

Expected outcomes:

• Increased student engagement and enhanced cognitive retention;

• Development of leadership, communication, and managerial competencies;

• Attraction of international partners and expansion of research capacity;

• Positioning the Naval Academy as a regional centre for immersive education and human-factor training in the maritime transport sector.

This initiative is not merely a technological investment but a strategic contribution to the mission of contemporary maritime higher education - to prepare professionals capable

of thinking, acting, and leading effectively in an increasingly dynamic and digitalised maritime environment.

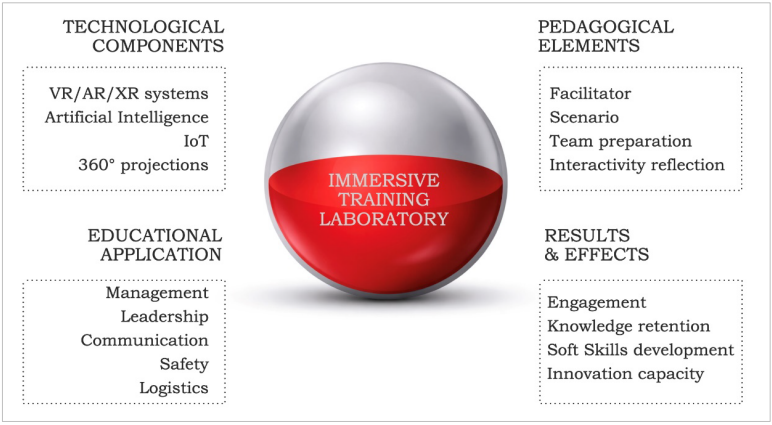

Figure 4. 5 Proposed Model for Developing an Immersive Learning Lab at Nikola Vaptsarov Naval Academy

4.3.3. International Practices and an Implementation Roadmap (with a Focus on the Nikola Vaptsarov Naval Academy)

International practices in maritime education clearly indicate a shift from a purely technical orientation toward integrated, experiential, and human-centric learning. Leading institutions recognise that today's maritime professional is not merely a technology operator, but a team leader working in a dynamic environment that demands intellectual agility, social awareness, and resilience under pressure (Atanasova, 2024; Stefanova, Kanev, & Mednikarov, 2023).

The revisions to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 2010) and the recommendations of the International Maritime Organization (IMO) introduce new priorities: leadership, teamwork, intercultural communication, stress resilience, and situational thinking. These are precisely the domains in which experiential, simulation-based, and immersive learning methods demonstrate their most significant value.

Global Trends and Examples

Observations of leading maritime academies and corporate training centres show that the contemporary educational model is multisensory, interactive, and experience-based.

• **California Maritime Academy** applies the "Learn by Doing" principle, placing students in realistic managerial and operational dilemmas.

• **Antwerp Maritime Academy** uses VR safety simulators; its lifeboat-launch module was named "Digital Project of the Year" for its realism and interactivity.

• **Rotterdam Mainport Institute** has created an innovative VR-based stress-training game that develops communication and high-pressure operational decision-making-highly relevant for modern port logistics.

• **Maersk Training** integrates VR scenarios and AI into its *Future Leaders* programme, focusing on crisis management, leadership, and team coordination.

• **Australian Maritime College (AMC)** employs fully integrated bridge and engine-room simulators (K-Sim Navigation) enabling end-to-end operational scenario training.

• **World Maritime University (WMU)** offers executive programmes centred on leadership, organisational culture, gender equality, and crew wellbeing, examined through the lens of the human factor.

• **Maritime Skills Academy (UK)** provides leadership and human-capability training tailored to practising professionals and corporate teams.

A clear common theme emerges: the focus has shifted from the tool to the human being-judgment, emotional regulation, ethics, coordination, and the ability to act and lead effectively in dynamic contexts.

Application and Implementation Roadmap for the Nikola Vaptsarov Naval Academy

Within this international context, the Nikola Vaptsarov Naval Academy is well-positioned to become a regional leader in the application of immersive technologies in maritime education. The Academy already maintains a strong technical base - including a modern simulation centre equipped with bridge and engine-room simulators developed in partnership with VSTEP, alongside established courses such as *Bridge Team, Resource Management*, *Leadership, and Teamwork*. This provides a robust foundation for the next stage: a transition from simulation-based to experiential and human-centric education.

Roadmap for Development

1. Establishment of VR/AR Laboratories

Virtual safety scenarios, emergency-drill training, logistical case simulations, and team-based exercises will enable students to immerse themselves in diverse contexts-from the bridge of a containership to the operations centre of a cruise company-without leaving the university.

2. Executive Programmes for Industry

Short, intensive courses for leaders and specialists in maritime transport focusing on strategic leadership, intercultural communication, resilience, and change management. Such programmes could be delivered in partnership with international training institutions (WMU, Maersk Training).

3. Updating Curricula

Integration of modules on soft skills, the human factor, and organisational behaviour into bachelor's and master's programmes. Courses such as *Communication and Leadership in the Maritime Industry* or *Team Psychology in Extreme Environments* would modernise the profile of the future maritime professional.

4. AI Tools and Adaptive Learning

Development of interactive software providing personalised feedback, tracking progress, and awarding micro-credentials for newly acquired competencies.

Organisational Framework and Expected Effects

Successful implementation requires a multidisciplinary team-faculty members, IT specialists, instructional designers, psychologists, and student innovators. This is not merely a technical upgrade but a cultural shift in how learning is conceived (Kalinov, 2022).

Instead of relying solely on the traditional "lecturer–listener" model, the new approach introduces a facilitator–team–scenario structure in which all participants contribute to the learning experience. In such formats, responsibility and assessment must be shared: value is generated not by the number of delivered lectures but by the quality of experiences, analyses, and lessons produced through real simulations.

Expected effects include:

• increased learner engagement and confidence;

• deeper skills acquisition;

• genuine readiness to act in complex situations;

• strengthening the Naval Academy's reputation as an innovative, human-centred maritime institution.

Strategic Contribution and Vision

Изграждането Establishing an Immersive Learning Laboratory at NVNA would have a long-term strategic impact. It could evolve into the nucleus of a future **Maritime Human Factors Hub**-a centre for research, training, and industry collaboration.

Such a laboratory would integrate:

• **Technology** (VR/AR, AI, simulators),

• **Pedagogy** (facilitation, gamification, experiential analysis),

• **Human Factors** (behaviour, communication, leadership, psychology).

This vision aligns fully with the philosophy of Industry 5.0-education in which technology serves the human being, not the other way around.

By following this trajectory, the Nikola Vaptsarov Naval Academy can become the first Bulgarian university to offer a fully integrated, immersive learning environment comparable to those of next-generation maritime academies worldwide.

The innovative approaches outlined here provide the foundation for developing new programmes and training formats oriented toward experience, experimentation, and digital interactivity. In the next chapter, this framework becomes fully operational-from gamified simulations and VR scenarios (Sotirov, Petrova, & Nikolova-Sotirova, 2024) to integrated models for leadership and organisational-culture development in the maritime transport sector.

The applied dimensions of human-centred learning in Maritime and inland waterway transport outline a new educational paradigm in which technology and human experience converge into a unified developmental model.

Simulations, immersive environments, and experiential methods do not replace the instructor-they expand the instructor's role from a transmitter of information to a facilitator of critical thinking, emotional maturity, and leadership.

This transformation turns education into an ecosystem of conscious learning in which digital tools support the human being, rather than the human adapting to the tool.

The empirical and conceptual foundations established in Chapters Three and Four are realised in Chapter Five, where the philosophy of Industry 5.0 is translated into concrete Executive Education programmes, training scenarios, and tools for leadership and soft-skills development.

Conclusions from Chapter Four

1. **Executive Education is emerging as a strategic instrument for human-centric transformation in the maritime and inland waterway transport sectors.** These programmes extend beyond traditional management training and function as environments for developing metacompetencies such as critical thinking, emotional intelligence, adaptability, and ethical awareness.
2. **Industry 5.0 requires integrating technology, the human factor, and organisational culture rather than simply digitalisation.** In this context, Executive Education combines XR/VR simulations, AI-based tools, and experiential learning methods that build leadership and team competencies in realistic yet safe environments.
3. **The Hybrid Human Factor Model for Industry 5.0 developed in this chapter represents an original scientific contribution.** It integrates four interacting nodes - individual, team, organisational, and educational - within a technologically supported ecosystem that unites philosophical, theoretical, empirical, and applied components.
4. **Education is a key mechanism for adaptation to Industry 5.0.** It mediates the interaction between humans and technologies, shapes professional identity, and develops decision-making under uncertainty, change management, and crisis leadership competencies.
5. **Technologies support, rather than replace, the human being.** In contemporary learning models, digital tools amplify cognitive, emotional, and team development

through simulations, biofeedback, AI-driven behavioural analysis, and personalised feedback.

6. **Inter-institutional partnerships and industry–academia collaboration are essential** for designing relevant, practice-oriented Executive Education programmes.
7. **International practices (WMU, Maersk Training, Antwerp Maritime Academy, etc.) demonstrate that experiential, immersive, and human-centric learning is becoming a global standard,** one that should also be adopted within the Bulgarian maritime educational context.
8. **The proposed implementation roadmap for the Nikola Vaptsarov Naval Academy outlines a clear vision for educational modernisation** through VR/AR laboratories, adaptive AI tools, interdisciplinary learning teams, and Executive programmes for industry professionals.
9. **Human values - ethics, trust, and social responsibility - are affirmed as strategic factors for organisational sustainability in the maritime and inland waterway transport sector.** Technological progress gains real meaning only when guided by humanistic principles.
10. **The chapter demonstrates that the human factor is the primary adaptive resource in complex technological environments,** rather than a secondary supplement to technical competencies.

CHAPTER V

SPECIALIZED TRAINING PROGRAMMES FOR LEADERSHIP AND SOFT SKILLS DEVELOPMENT IN THE MARITIME AND INLAND WATERWAY TRANSPORT SECTOR

This chapter presents the applied dimensions of the Hybrid Human Factor Model for Industry 5.0 through specially designed Executive Education and Executive Training programmes. These programmes target strategic thinking, team interaction, organisational culture and conscious leadership.

The two types of formats are complementary:

- Executive Education – conceptual programmes with an academic and strategic profile;
- Executive Training – experiential formats focused on personal transformation and the application of knowledge in real operational contexts.

The formats are structured to activate the five systemic levels of the model and to support the development of human capital in the maritime industry.

By presenting six complementary training formats - three academic and three experiential - this chapter operationalises the concepts of the Hybrid Human Factor Model for Industry 5.0 and demonstrates their applicability in sectoral, organisational and educational contexts.

The structure of the chapter is as follows:

- Section 5.1 presents the Executive Education programmes;
- Section 5.2 examines the specialised Executive Training formats;

- Section 5.3 provides their conceptual validation against the model and the empirical results.

5.1. System of Specialized Programs Supporting the Hybrid Human Factor Model for Industry 5.0

Three Executive Education programmes have been developed to address the key dimensions of human-centric leadership in the era of Industry 5.0:

• **"Soft Skills for Maritime Leaders in the Era of Industry 5.0"** – focusing on emotional intelligence, communication and authentic influence;

• **"Intercultural Differences and Communication in the Global Maritime Environment"** – developing cultural awareness and effective interaction in multinational teams;

• **"Managing Organizational Culture and Change in the Era of Industry 5.0"** – strategic development of culture, trust and organisational adaptability.

Each programme reflects a distinct level of the **Hybrid Human Factor Model for Industry 5.0**:

• **individual level** – self-awareness, emotional competence and personal resilience;

• **interpersonal level** – communication, collaboration and relational effectiveness;

• **organizational level** – culture, change dynamics and shared values.

Taken together, the programmes form a coherent educational trajectory that connects theoretical foundations, empirical evidence and practical tools for leadership and soft-skills development in the maritime sector.

5.1.1. Conceptual Foundations and Content of the Specialized Training Programs

The three programmes are designed to cultivate human-centric competencies that support the development of leadership maturity, cultural intelligence and the ability to manage organisational transformation.

They are structured as an interconnected triadic framework, guided by the philosophy **"from human behaviour → to interaction in difference → to a culture of trust and change"**, which shapes the professional as a self-aware leader capable of exerting sustainable influence in the global maritime environment (see Figure 5.1). This philosophical triad defines the transformative outcomes the programmes aim to achieve at the individual, interpersonal and organisational levels.

Figure 5. 1 Conceptual Triad of Transformation

In parallel, a pedagogical triad - **"know – communicate – lead"** (see Figure 5.2) - guides the learning process and the overall educational trajectory. The two triads function as complementary frameworks: the first sets the direction of development, while the second delineates the pathway for its realisation. This approach aligns with contemporary interpretations of experiential and reflective learning, in which transformation emerges through experience and deepened awareness (Mintzberg, 2004; Friga, Bettis, & Sullivan, 2003).

Figure 5. 2 Pedagogical Triad "Know – Communicate – Lead"

The three training programmes follow the logic of the pedagogical triad and are designed as a sequential developmental pathway - from personal awareness, through team interaction, to organisational transformation - consistent with the philosophy of human-centric leadership and education in the spirit of Industry 5.0 (European Commission, 2021; Nahavandi, 2019).

Each course builds upon the foundations established by the previous one:

• **"Soft Skills for Maritime Leaders in the Era of Industry 5.0"** establishes the basis of personal and emotional awareness;

• **"Intercultural Communication and Team Effectiveness On Board"** develops social intelligence, adaptive communication and the ability to work effectively in cultural diversity;

• **"Managing Organizational Culture and Change in the Era of Industry 5.0"** transforms these competencies into strategic leadership and organisational change capability.

The main parameters of the programmes - including objectives, methodology and duration - are presented in Table 5.1.

Table 5. 1 Proposed Executive Education Programs for the Maritime and Logistics Sector in the Context of Industry 5.0

Program Title	Soft Skills for Maritime Leaders (Industry 5.0)	Intercultural Leadership and Teams in Water Transport (Industry 5.0)	Organizational Culture and Change (Industry 5.0)
Main Focus and Objectives	• Development of personal and emotional awareness, empathetic and assertive communication, ethical influence, and human-centric leadership. • Enhancing skills for leading, motivating, and managing people in hybrid and digital environments.	• Development of intercultural awareness, adaptive communication, and management of differences in multicultural teams. • Emphasis on trust, psychological safety, and cooperation as key factors for safety and effectiveness.	• Building skills for organizational culture transformation through trust, participation, and value-based leadership. • Managing change supported by technology as a tool for transparency, participation, and learning.
Methodology and Training Approaches	• Experiential and interactive learning; simulations; role-play scenarios; cases from maritime practice. • Profiling instruments (EQ, DISC, MBTI). • Facilitated coaching; group discussions; reflective journals.	• Scenarios for multicultural conflicts; VR simulations; facilitated dialogue. • Implicit Association Tests (IAT), behavioral feedback. • Group sessions, coaching, and reflection.	• Interactive lectures, facilitated discussions and role-play situations. • Simulations of organizational processes; analysis of people and teams; norms mapping. • Digital tools for participation and feedback; reflective sessions; culture maps; VR.
Duration	3 days/24 training hours	3 days/24 training hours	2 days/16 training hours

The detailed curricula - including modules, methodologies, assessment instruments and outcome indicators - are presented in the Appendices of this study.

The programmes can be implemented in both university and corporate contexts, serving as an applied framework for developing social, cultural and managerial competencies in the maritime and inland waterway transport sector. They are grounded in the following overarching principles:

• interactive and experiential learning design;

• an individual reflective journal and development plan integrated into every course;

• instructors acting as coaches and facilitators rather than traditional lecturers;

• embedded mentoring provided by experienced professionals from the maritime sector.

The following subsections present the content and methodological structure of the three programmes.

5.1.2. Soft Skills for Maritime Leaders in the Era of Industry 5.0

The specialised training programme *"Soft Skills for Maritime Leaders in the Era of Industry 5.0"* is designed to cultivate a new executive profile in the maritime industry - a leader who combines technological competence with people-centred awareness, empathy and social intelligence. Developed as an Executive Education course, it introduces a human-centred leadership model in which effectiveness and safety are achieved through understanding, trust and team engagement (Goleman, 1995; Boyatzis & McKee, 2005; Cherniss, 2010).

Its core aim is to equip maritime professionals with a deep understanding of human behaviour, motivation and emotional dynamics in a multicultural, technologically intensive and increasingly distributed work environment. The programme goes beyond traditional technical preparation by emphasising emotional, social and communication intelligence as key determinants of organisational performance (Mintzberg, 2004; Friga, Bettis, & Sullivan, 2003).

The structure follows a three-day executive format organised into three interconnected developmental levels:

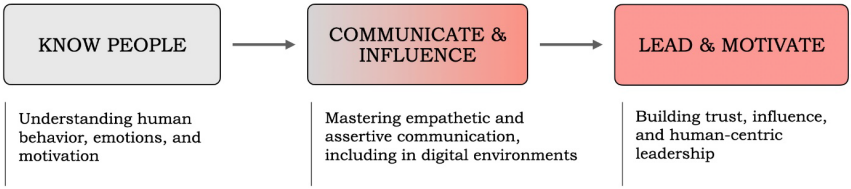

Figure 5. 3 Conceptual Structure of the Specialized Program

1. **Knowing People** – understanding human behaviour, emotions and motivation;
2. **Communicating and Influencing** – mastering empathetic and assertive communication, including in digital contexts;
3. **Leading and Motivating** – building trust, meaningful influence and human-centred leadership.

Methodologically, the training is experiential, interactive and transformational, combining simulations, coaching, video analysis, real maritime case studies, profiling tools (DISC, MBTI), group facilitation and reflective journals. The approach integrates action-learning and reflective-learning principles, supporting the development of authentic leadership behaviours (Boyatzis & McKee, 2005; Cherniss, 2010).

The programme outcomes include enhanced conflict-management capacity through empathy, stronger trust and psychological safety within teams, and more effective alignment of organisational goals with human wellbeing. In this way, the course contributes to the development of leaders who not only manage processes but inspire people and cultivate a culture of belonging and meaning.

The full training curriculum is provided in Appendix 2 of this monograph.

5.1.3. Programme "Intercultural Leadership and Team Management in Maritime Transport in the Context of Industry 5.0"

The primary objective of this programme is to develop a new type of maritime professional who combines technical expertise with strong cultural awareness, emotional intelligence and adaptive behaviour. The training addresses the challenges arising from cultural and religious diversity and aims to build effective communication and trust in multicultural teams - a defining feature of the contemporary maritime sector. The programme draws on established models of intercultural competence and Cultural Intelligence (Deardorff, 2006; Earley & Ang, 2003; Hofstede, Hofstede, & Minkov, 2010).

The programme follows a three-day interactive and experiential format that integrates theory, practice and personal reflection. Its structure is built around three sequential modules:

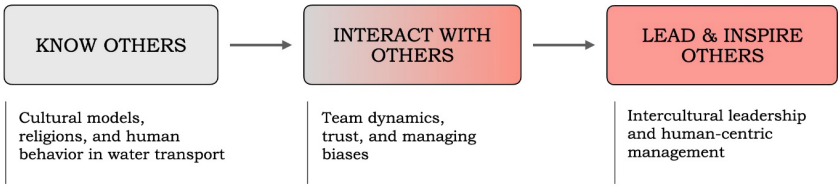

Figure 5. 4 Conceptual Structure of the Specialized Program

1. **Knowing the Other** – cultural models, religions and human behaviour in maritime transport;
2. **Interacting with the Other** – team dynamics, trust-building and managing biases;
3. **Leading and Inspiring the Other** – intercultural leadership and human-centred management.

The methodology is grounded in the principles of experiential learning and includes simulations, role-play exercises, video analysis, group discussions, case studies and coaching-based facilitation (Mintzberg, 2004; Friga et al., 2003). Tools such as the Implicit Association Test (IAT) are used to reveal subconscious attitudes, alongside EQ/CQ self-assessments inspired by emotional and cultural intelligence models (Goleman, 1995; Earley & Ang, 2003).

The programme seeks professional transformation rather than simple knowledge acquisition. Participants undergo a developmental process of awareness, interaction and leadership evolution. The course concludes with a certification simulation, *"Captain of the Cultural Bridge,"* which synthesises all acquired skills and symbolically marks the transition from knowledge to intentional action.

The full curriculum of the training is provided in Appendix 3 of this monograph.

5.1.4. Organizational Culture and Change Management in the Era of Industry 5.0

The specialised programme **"Organizational Culture and Change Management in the Era of Industry 5.0"** is designed as an Executive Education course for maritime leaders and managers who recognise that sustainable organisational performance begins with culture and human relationships. It develops the ability to view culture not as a fixed structure, but as a living system of values, behaviours and shared meanings that shape identity, motivation and safety - an understanding consistent with contemporary interpretations of organisational culture (Schein, 2016).

The programme's primary aim is to cultivate conscious leadership capable of guiding cultural transformation through trust, participation and shared vision. Its mission is twofold:

• **Professional** – providing tools for analysing and transforming organisational culture and applying models such as Schein's Three Levels of Culture, Kotter's Change Model and ADKAR (Schein, 2016; Kotter, 1996; Hiatt, 2006);

• **Human** – developing empathy, leadership presence and a culture of transparency and collaboration, where change is understood not as a threat, but as a shared journey toward growth.

The training follows a two-day structure organised around two core modules:

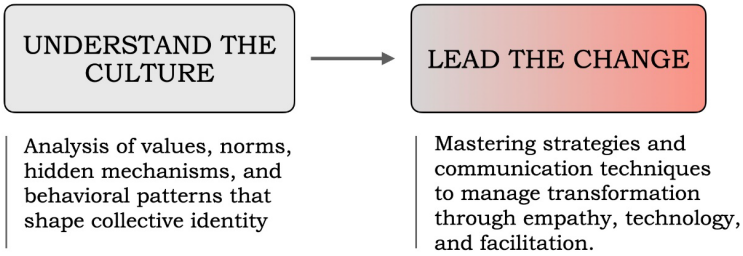

Figure 5. 5 Two-Day Training Model

1. **Understanding Culture** – analysing values, norms, hidden mechanisms and behavioural patterns that shape collective identity;
2. **Leading Change** – mastering strategies and communication approaches for managing transformation through empathy, technological tools and facilitation.

The methodology is experiential and interactive, incorporating simulations, role-play scenarios, video analysis, facilitated discussions, coaching and digital platforms (VR, Mentimeter, MS Teams, AI-based feedback systems). This approach integrates the human and technological dimensions of leadership, creating a realistic environment for insight and practical application.

The programme emphasises that organisational culture is a strategic resource shaping resilience, safety and innovative capacity. Leaders are trained to manage change not through control, but through collaboration and participation, fostering learning

organisations in which every member contributes to collective evolution - a perspective consistent with leading theories of organisational change (Kotter, 1996; Schein, 2016).

From an academic standpoint, the course offers an innovative learning model for the maritime and logistics sectors, combining management practice, psychology and digital technologies in the spirit of Industry 5.0. It introduces the concept of an "intelligent culture," where people and technologies interact as partners, and organisational change becomes a process of collective learning and shared leadership (Demir et al., 2023).

The full curriculum of the programme is presented in Appendix 4 of this monograph.

5.1.5. Expected Outcomes and Contribution of the Proposed Programmes

The proposed Executive Education programmes - *"Intercultural Communication and Onboard Team Effectiveness," "Soft Skills for Maritime Leaders in the Era of Industry 5.0,"* and *"Organisational Culture and Change Management"* - form a comprehensive framework for developing human potential in the maritime industry. They transcend traditional training logic by integrating professional competencies, values-based leadership, and a humanistic philosophy of organisational evolution.

Together, the three programmes represent complementary perspectives of contemporary maritime leadership:

• **"Soft Skills for Maritime Leaders"** – cultivating an inner leadership core, resilience, and conscious behaviour;

• **"Intercultural Communication and Team Effectiveness"** – fostering connection, trust, and collaboration in global teams;

• **"Organisational Culture and Change Management"** – enabling system-level transformation through values, ethics, and community.

Collectively, they outline a developmental path from personal awareness to collective leadership and organisational maturity - aligned with the principles of Industry 5.0, where technology and humanity operate as mutually reinforcing forces.

1. Expected Outcomes at the Individual Level

The programmes aim to develop professionals who:

• think systemically and act consciously;

• lead with ethics, responsibility, and empathy;

• communicate confidently within multinational crews;

• demonstrate resilience and autonomy under uncertainty and change.

In this way, they shape leaders who not only manage processes but embody culture - human, professional, and moral.

2. Outcomes at the Team and Organisational Level

• building teams characterised by synchronisation and mutual trust;

• fostering a culture of transparency and reciprocal support;

• integrating human-centred practices into management and HR systems;

• reducing conflicts, cultural barriers, and communication risks.

Thus, organisations develop not through pressure, but through meaning, belonging, and shared purpose.

3. Outcomes at the Sectoral and Strategic Level

• strengthening cooperation between academia and industry through joint initiatives, internships, and simulations;

• establishing a new standard for maritime education that integrates soft skills, ethics, and systems thinking;

• preparing a generation of leaders capable of transforming technological shifts into social and economic progress.

Through these initiatives, the *Nikola Vaptsarov Naval Academy* positions itself as a regional centre for humanistic leadership in synergy with advanced technologies.

4. Academic and Educational Contribution

• developing an interdisciplinary model integrating organisational behaviour, leadership, and technology;

• implementing experiential and facilitated learning formats;

• establishing a foundation for international research projects and emerging standards.

In this sense, the programmes function not only as educational offerings but as a methodological framework for research and development.

5. Symbolic Contribution: Leadership as a Human Journey

The three programmes demonstrate that leadership is not merely a function of position, but a process of inner and collective growth.

When the individual is conscious, the team aligns;

when the team is connected, the organisation progresses;

when the organisation is resilient, the sector transforms.

This captures the essence of Industry 5.0 - not simply a technological transition, but a culture of respect, shared evolution, and human-centred progress.

5.2. System of Training Formats Supporting the Hybrid Model for Human Factor Development

Three mutually reinforcing training programmes have been developed, each targeting essential leadership and social competencies aligned with the principles of Industry 5.0 and supporting the **Hybrid Human Factor Model for Industry 5.0**:

• **FLOWSTATE** - develops cognitive and team effectiveness through attention mastery, synergy, and focused collective energy;

• **HUMANCODE** - addresses emotional interaction, empathy, and trust as the foundation of human-centred leadership;

• **DEEPWATER** - builds on the previous two by strengthening resilience, psychophysiological stability, and conscious leadership presence under pressure.

Together, these three trainings establish a coherent pedagogical logic:

> When a person is stable (DEEPWATER), their thinking flows clearly (FLOWSTATE), and their words resonate (HUMANCODE) - the system becomes human-centered.

5.2.1. Concepts and Content of the Developed Specialized Training Programs

The developed trainings represent an applied form of experiential learning aimed at cultivating skills for self-regulation, empathy, leadership presence, and resilience in the maritime industry. Unlike the academic programmes, which build knowledge and conceptual understanding, these formats translate the human-centred principles of Industry 5.0 into real, embodied, emotional, and team-based experiences. Through this approach, participants not only acquire new competencies but also observe and reflect on their own reactions, interactions, and leadership choices in conditions closely resembling maritime practice.

The trainings follow the pedagogical triad **"Become Aware of Yourself → Connect with Others → Lead with Depth"** (Figure 5.6), which guides the developmental progression from internal self-management to social connectedness and purposeful leadership action. This framework functions as the overarching principle of all three programmes, while each retains its own internal logic and applied model.

Figure 5. 6 Pedagogical Triad of the Specialized Trainings

Each training develops a distinct layer of human behaviour and professional competence:

• **FLOWSTATE Training** – internal resilience, attention, focus, and psychophysiological self-regulation;

• **HUMANCODE Training** – social and emotional intelligence, communication, trust, and influence;

• **DEEPWATER Training** – leadership presence, decision-making under pressure, and ethical responsibility in realistic maritime scenarios.

The key parameters of the programmes are summarised in **Table 5.2**.

Table 5. 2 Developed Executive Training Programs for the Maritime Sector in the Spirit of Industry 5.0

Training Title	FLOWSTATE Training	HUMANCODE Training	DEEPWATER Training
Main Focus and Objectives	• Development of focus, psychophysiological regulation, and team synchronization for high performance in technological and maritime operational environments.	• Development of emotional awareness, trust, empathy, and communication influence in multicultural and hybrid teams.	• Development of resilience, presence, and ethical leadership through decision-making under pressure in real maritime conditions.
Methodology and Training Approaches	• Breathing and body techniques, cognitive protocols, system simulations, visualized indicators, facilitated coaching, group synchronization.	• Forum theatre, role-play scenarios, facilitated dialogue, analysis of nonverbal signals, exercises for convictions and psychological safety, reflective journals.	• Experiential training in maritime environment, crisis missions, moral dilemmas, gamification, team task "After the Storm", Trust Meter, resilience mapping.
Duration	1 day/8 training hours	3 days/24 training hours	2 days/16 training hours

The three trainings constitute a practical operationalisation of the human-centred model, demonstrating how the principles of Industry 5.0 can be applied in real professional contexts through simulations, emotional engagement, and collective learning. In this way, the content is not merely understood but experienced.

Each training format includes:

• interactive simulations, facilitated discussions, and game-based scenarios;

• individual coaching components and structured group reflection;

• a personal reflective journal and development plan;

• facilitators who act as learning partners rather than traditional lecturers;

• a mentoring element involving practitioners from the maritime sector.

The trainings can be implemented in university, corporate, or hybrid formats and function as a practical tool for developing human capital and leadership potential in the maritime transport sector.

5.2.2. FLOWSTATE Training – Cognitive Synchrony and Collective Intelligence

The FLOWSTATE Training is an experiential learning format that translates the concept of psychological "flow" into real operational and team dynamics. It examines how internal focus, regulation of physiological responses, and conscious presence shape performance in high-risk and dynamic maritime environments. The approach rests on the idea that optimal performance arises from a balance between challenge and capacity (Csikszentmihalyi, 1990; Keller et al., 2021), while sustainable behaviour requires the integration of psychological and somatic processes (Kabat-Zinn, 2013).

The primary aim of the training is to develop internal psychological resilience, the ability to act under pressure, and synchrony with the team in real operational conditions. The format combines somatic learning, cognitive-behavioural regulation, and simulations of maritime scenarios, allowing knowledge to be experienced rather than merely understood. The content is structured within the following triad:

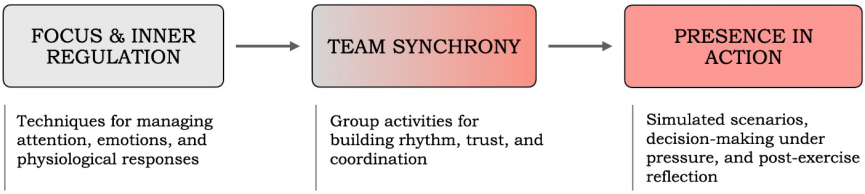

Figure 5. 7 FLOWSTATE Training Triad: From Inner Regulation to Team Synchrony and Presence in Action

The methodology includes:

- real-time simulations with visualised feedback;
- facilitated coaching in a dynamic operational context;
- biofeedback for monitoring attention and physiological activation;
- analysis using indicators such as Flow Index, Emotional Stability Score, and Team Clarity Metric;
- VR and hybrid simulations using the technological infrastructure of the Nikola Vaptsarov Naval Academy.

FLOWSTATE enables an embodied understanding of the relationship between the human operator and the system, positioning technology as a partner in decision-making rather than a substitute for human competence. Effectiveness emerges when internal focus evolves into collective presence and team actions synchronise through shared rhythm, trust, and transparency.

The full content of the training-including exercises, assessment tools, and protocols-is provided in Appendix 5.

5.2.3. HUMANCODE Training – Communication, Influence, and Social Intelligence

HUMANCODE Training is an experiential learning format focused on developing social and emotional intelligence, authentic communication, and ethical influence in multinational, hybrid, and high-risk environments. Unlike training formats that emphasise cognitive–behavioural techniques or technical preparation, HUMANCODE develops the ability to read emotional signals, build trust, and lead through relationships rather than formal authority.

The approach is grounded in the concepts of emotional and social intelligence (Goleman, Boyatzis, & McKee, 2013; Mayer, Salovey, & Caruso, 2008), as well as contemporary research on emotions in team processes (Walter, Cole, & Humphrey, 2022) and trust in hybrid work settings (Haas & Mortensen, 2016). Methodologically, the training transforms social interaction into an observable, interpretable, and developable process through experience and reflection.

The training follows a triadic structure that reflects the progression from internal awareness to interpersonal impact:

Figure 5. 8 HUMANCODE Training Triad: "Decode – Connect – Influence"

HUMANCODE Training incorporates:

- role-based scenarios and simulations of critical communication situations;
- dramaturgical and psychodramatic techniques for expression and self-awareness;
- facilitated dialogue and coaching;
- group assessments and emotional-profiling tools;
- a reflective journal and personal development plan.

These methods turn communication into a state of conscious interpersonal connectedness rather than a purely technical skill.

HUMANCODE is built on the understanding that effective leadership in the maritime industry begins with understanding the human being. Participants learn to "decode the human code" of emotions and relationships, transforming interpersonal connection into intentional and ethical influence that strengthens safety, trust, and organisational resilience.

The full structure of the training, including role scenarios and assessment instruments, is presented in Appendix 6.

5.2.4. DEEPWATER Training – Leadership and Resilience in a Real Maritime Environment

DEEPWATER Training is an experiential leadership format designed as a living laboratory for examining human behaviour under pressure and in high-risk environments. Conducted in a real maritime setting - the "Karantinata" training base in Varna - the programme places participants in the role of a crew navigating the simulated scenario *"After the Storm."* The format is fully outdoor and unfolds through missions, dilemmas, and team-based decisions that recreate the dynamics of leadership under uncertainty, limited resources, and rapidly shifting operational conditions.

The training functions as a controlled crisis in which participants experience their own reactions, observe group behaviour, and develop the capacity for responsible action within complex systems. DEEPWATER does not simply train skills - it creates conditions in which participants can clearly recognise how their internal states influence decision-making, communication, and safety, which is essential for maritime professions and leadership in high-risk environments.

The philosophy of DEEPWATER is grounded in the understanding that sustainable leadership begins at the moment of contact with the situation, develops through conscious stress regulation, and culminates in purposeful action that generates meaning and safety for the team. This developmental pathway is structured through the triad:

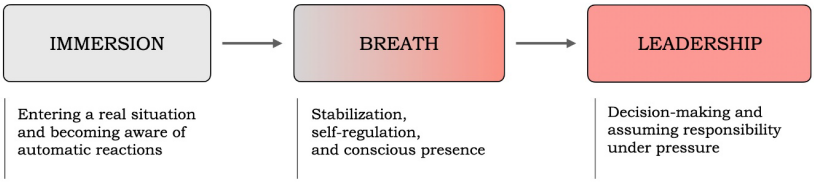

Figure 5. 9 DEEPWATER Training Triad: From Reactivity to Responsible Leadership Under Pressure

The training incorporates:

- real maritime and logistics simulations;
- controlled stress-exposure exercises adapted to the environment;
- somatic and cognitive regulation techniques;
- group analysis and facilitated debrief sessions;
- tools for tracking physiological responses and decision-making patterns.

The process is delivered in collaboration with educators, facilitators, instructors, and active maritime professionals.

DEEPWATER Training reinforces the principle that leadership in high-risk environments begins with inner stability. Only when a person can *"immerse," "breathe,"* and act

consciously can they transform stress dynamics into a space for meaningful influence, ethical decision-making, and organisational safety.

The full structure of the training - including scenarios, exercises, and assessment instruments - is presented in Appendix 7.

5.2.5. Expected Outcomes and Contribution of the Specialized Trainings

The three specialized training programs presented-**DEEPWATER**, **FLOWSTATE**, and **HUMANCODE**-form a complete triad of human-centric training that embodies the philosophy of **Industry 5.0**.

This triad represents the three dimensions of contemporary leadership:

• **DEEPWATER** – depth and personal resilience;

• **FLOWSTATE** – synchrony between thought and action;

• **HUMANCODE** – connection, empathy, and human influence.

Together, they create an integrated framework for developing human potential in the maritime, logistics, and managerial sectors, where technology is viewed not as a substitute, but as a **partner** to human capability. The three programs position the Nikola Vaptsarov Naval Academy as a center for integral training - a space where the sea, technology, and human consciousness meet.

1. A Holistic Model of Human Transformation

These programmes are not standalone courses but interconnected stages of a unified developmental process - from inner stability, through cognitive synchrony, to social presence:

• **DEEPWATER Training** develops emotional stability, self-regulation, and psychological flexibility under pressure;

• **FLOWSTATE Training** cultivates cognitive synchrony, systems thinking, and collective intelligence;

• **HUMANCODE Training** builds social sensitivity, empathy, ethical communication, and relational influence.

This sequence mirrors the natural progression of the human system in complex environments - from a stable inner core, to clarity of thought, to meaningful connection with others.

2. Expected Outcomes at the Individual Level

The programmes aim to develop a new type of maritime and logistics professional - self-aware, emotionally mature, system-thinking, and authentically communicative. Participants acquire:

• resilience to stress and skills for psychological self-regulation;

• cognitive clarity and adaptability in dynamic settings;

• a strong communication culture and empathic leadership behaviour;

• capacity for decision-making under pressure and effective teamwork;

• an integrated sense of personal mission and professional responsibility.

The result is a professional characterised by depth, clarity, and social presence - the three layers of competence underpinning modern leadership.

3. Outcomes at the Organisational and Sectoral Levels

Implementation of these programmes at the N. Y. Vaptsarov Naval Academy and in partner organisations leads to:

• enhanced training quality through experiential and gamified approaches;

• development of an organisational culture grounded in trust, openness, and shared responsibility;

• formation of teams with high synchrony and communicative clarity;

• increased engagement, motivation, and sense of belonging;

• improved coordination in dynamic or crisis situations.

For the maritime and logistics industries, these outcomes translate into tangible value - fewer errors, greater operational efficiency, and more resilient teams.

4. Scientific and Academic Contribution

From an academic standpoint, the three programmes represent an innovative integrated training model connecting psychology, technology, and pedagogy. Key contributions include:

• development of an experiential-education model for the maritime and logistics sectors;

• creation of gamified simulations for soft-skills development;

• introduction of an interdisciplinary methodology based on cognitive, emotional, and social synchronisation;

• positioning the N. Y. Vaptsarov Naval Academy as an innovative training hub within Industry 5.0, where technology serves the human being.

5. Contribution to Business and Society

The programmes encourage sustainable, ethical, and human-centred leadership based not on control but on trust and collaboration. Participants develop:

• moral clarity and ethical sensitivity;

• a culture of dialogue and mutual respect;

• proactivity and innovative thinking;

• the ability to inspire rather than merely manage.

Thus, the training becomes a genuine instrument for social transformation - a bridge between education, industry, and the humanistic values of next-generation leadership.

6. Symbolic Contribution: The Human as a System

The three programmes outline a developmental path from inner stability (DEEPWATER), through cognitive synchrony (FLOWSTATE), to human influence (HUMANCODE), placing the human factor at the centre of transformation.

This reflects the essence of the humanistic vision of Industry 5.0 - not technological dominance, but synergy between knowledge, ethics, environment, and human presence.

5.3. Validation of the Developed Trainings and the Hybrid Human Factor Model for Industry 5.0

This section provides an applied validation of the developed training interventions, which differs from the empirical validation of the Hybrid Human Factor Model for Industry 5.0 presented in Chapter Four. While Chapter Four validates the model analytically through statistical relationships and theoretical argumentation, the validation here has a dual - in fact, four-fold - character and examines the constructive and conceptual validity of the trainings.

Validation is carried out by comparing:

1. the conceptual principles of the Hybrid Human Factor Model for Industry 5.0,
2. the empirical relationships established in the study,
3. the real needs of the maritime sector, and
4. the value-based and methodological foundations of Industry 5.0.

This process confirms consistency with the theoretical model and methodological logic, while recognising that the assessment of real behavioural and organisational effects will be established through future pilot implementation and Kirkpatrick-level evaluation. The empirical validation of outcomes from real-world application represents a subsequent stage and will be addressed in future research.

5.3.1. Methodological Framework of the Validation

The validation process is conducted through a combined approach that includes:

• **Constructive validity** – the degree to which the programmes operationalise the key elements of the model;

• **Empirical validity** – alignment between programme content and the statistically established relationships;

• **Applied validity** – relevance and suitability of the programmes for the actual organisational and professional environment;

• **Value-based validity** – consistency with the principles of Industry 5.0 (human-centricity, sustainability, ethics, and technological synergy).

This integrated approach ensures that the trainings are not developed intuitively but are methodologically derived from data, model dynamics, and real sectoral requirements.

5.3.2. Alignment Between Empirical Results and the Content of the Trainings

The validation is conducted through a systematic comparison between the empirical relationships and the thematic focus of the programmes and trainings. This comparison demonstrates that the trainings accurately reflect the logic of the model, translating its conceptual linkages into practical competence development.

• **The individual level** is validated through the programme *"Soft Skills for Maritime Leaders in the Era of Industry 5.0"* and the **HUMANCODE Training**, both of which develop self-reflection, social intelligence, and personal responsibility.

• **The team level** is operationalised through the **FLOWSTATE Training** and the programme *"Intercultural Communication and Team Effectiveness Onboard"*, each focused on trust, collaboration, and collective awareness.

• **The organisational level** is represented in the programme *"Organizational Culture and Change Management in the Era of Industry 5.0"*, which emphasises ethics, values, and authentic leadership.

• **The educational and technological level** is embodied in the **DEEPWATER Training**, where knowledge and experience are transformed into lived practice in a real maritime setting - a context that integrates technology, ethics, and human resilience.

The most pronounced needs of the sector - resilience, ethics, trust, and communication - are precisely the competencies targeted by the programmes, which emphasise development rather than theoretical instruction.

To structure the comparison and visualise the degree of alignment, Table 5.3 presents an integrated validation framework linking the Hybrid Human Factor Model for Industry 5.0 with the empirical dependencies, sectoral needs, and the values of Industry 5.0.

Table 5. 3 Applied Validation of the Specialized Trainings Against the Hybrid Human Factor Model and the Requirements of Maritime and Inland Waterway Transport

Specialized Training	Level of Impact	Alignment with the Hybrid Model (Ch. 4)	Alignment with Empirical Dependencies (Ch. 3)	Alignment with the Needs of Water Transport	Alignment with Industry 5.0 Values
Soft Skills for Maritime Leaders (Industry 5.0)	Individual/ Leadership	Conscious leadership, self-regulation, personal development	Emotional intelligence, trust, social influence	Improving team effectiveness, leadership presence, communication	Human-centricity, ethics, motivation through meaning
Intercultural Leadership and Teams (Industry 5.0)	Interpersonal/ Team	Social connectedness, adaptive communication, collective awareness	Intercultural attitudes, psychological safety, group dynamics	Management of multinational crews, conflict reduction, trust	Diversity, tolerance, respect, social responsibility
Organizational Culture and Change (Industry 5.0)	Organizational	Values, cultural systems, transformation, learning culture	Dependencies between culture, effectiveness, and engagement	Need for cultural change, digital transformation, safety	Sustainable organizations, transparency, shared leadership
DEEPWATER (Industry 5.0)	Environmental-experiential/ Body-integrative	Embodied leadership and deep transformation through interaction with the	Influence on autonomy, bodily awareness, and leadership presence	Real preparation in operational maritime environments; learning through	Human - environment synergy, sustainability,
FLOWSTATE (Industry 5.0)	Cognitive/Team	Cognitive synchrony, integration of thought - action, joint focus	Balance between challenge and capacity, dynamics of team decisions	Operational tasks, team coordination, safety and rhythm in action	Human–technology synergy, optimal effectiveness, presence
HUMANCODE (Industry 5.0)	Social/ Communication	Trust, connection, empathy, nonverbal leadership signals	Emotional intelligence, cultural signals, behavioral mechanisms	Leadership influence, collaboration, moral norms	Ethics of cooperation, care, collective intelligence

The synthesised validation confirms that the training interventions operationalise the essential elements of the model, transforming theoretical relationships into practical developmental mechanisms. This provides a basis for several overarching conclusions regarding the applicability of the Hybrid Human Factor Model for Industry 5.0.

5.3.3. Conclusions and Confirmation of the Hybrid Model as an Applied Framework

The results of the constructive validation show that the relationship between:

- the Model (conceptual framework),
- the empirical evidence (diagnosis of the real environment), and
- the trainings (interventions)

operates as a spiral model of translational knowledge.

The trainings do not merely align with the model; they translate its principles into practical mechanisms and create conditions for measurable future change in leadership behaviour.

Thus, the integrated model can be regarded as a practically applicable methodology for developing human-centred leadership in the maritime industry, rather than solely a theoretical construct. This opens perspectives for:

- certification programmes and professional qualification in the sector;
- organisational policies and transformation initiatives;
- academic courses and simulation-based training.

Conclusions from Chapter Five

Chapter Five demonstrates that the specialised trainings developed in this dissertation constitute the applied realisation of the Hybrid Human Factor Model for Industry 5.0, transforming its theoretical interrelations into practical mechanisms for developing the human factor within the maritime industry. They integrate individual awareness, team dynamics, organisational culture and the technological–environmental context into a unified framework for leadership development.

Building on the empirical verification presented in Chapter Four, this chapter extends the model by validating the trainings conceptually and constructively against the empirical data, sectoral needs and the principles of Industry 5.0. The programmes activate different levels of the model - strategic thinking and human-centred leadership at the conceptual level, and applied behavioural skills through action, interaction and real-world scenarios. In this way, a spiral cycle is established in which knowledge becomes behaviour, and behaviour generates new professional insight.

The maritime environment is interpreted not merely as an operational setting but as an active pedagogical space that shapes human-centred leadership through interaction, responsibility and lived professional experience. This reflects the value-based logic of

Industry 5.0, in which the human, the technology and the environment function as an interdependent system.

In this sense, the Hybrid Human Factor Model for Industry 5.0 emerges not only as a conceptual structure but as an applied methodology for designing trainings and organisational policies aimed at the sustainable development of the human factor, trust, adaptability and collective effectiveness within the maritime sector.

The validation in this chapter is project-based and methodological, grounded in the empirically verified model. Assessing the real impact of the trainings through pilot implementation and subsequent multi-layered empirical evaluation constitutes the next stage in embedding the model into professional and educational contexts.

After synthesising the results, the following key conclusions are formulated:

1. The theoretical core of the Hybrid Human Factor Model for Industry 5.0 is empirically verified through the statistically significant relationships between leadership, psychological and cultural factors presented in Chapter Four.
2. The specialised trainings operationalise the model by translating conceptual interrelations into practical mechanisms for human-factor development.
3. The academic programmes develop strategic and conceptual leadership capability, oriented toward awareness, ethics, values and cultural transformation.
4. The training formats develop practical, behavioural and situational skills through action, interaction and experiential scenarios in real professional conditions.
5. The maritime environment functions as a pedagogical medium for transformation, fostering human-centred leadership through experience, contextual responsibility and conscious presence.
6. The model serves as a methodology for designing trainings, organisational policies and professional standards directed at the sustainable development of the maritime sector.
7. The real impact on practice remains to be measured through pilot implementation of the trainings and a multi-layered empirical evaluation of behavioural, team and organisational outcomes.

In conclusion, the specialised trainings presented in this chapter do not merely apply the Hybrid Human Factor Model for Industry 5.0 in real contexts - they establish a sustainable framework for human-factor development, in which knowledge is transformed into behaviour, and behaviour generates new knowledge and organisational meaning. Through this cyclical logic, the training formats translate the conceptual principles of Industry 5.0 into practices of conscious leadership, ethical culture and technologically supported humanity, placing the human being at the centre of the maritime profession and organisational evolution.

Thus, Chapter Five delineates the applied bridge between the theoretical foundations of the model and its future empirical implementation in the sector, establishing the conditions for the long-term transformation of professional training, management practices and leadership standards.

CONCLUSION

In the context of Industry 5.0, organizational behaviour becomes a strategic axis of sustainable development, innovation, and human-centred transformation within the waterborne transport sector. This monograph has traced the evolution of the human factor in a technologically intensive, multicultural, and high-risk environment, revealing the dynamics between individual competencies, team mechanisms, organizational culture, and educational practices. The theoretical, methodological, and empirical results presented herein outline an integrative framework for understanding human behaviour in systems where people and technologies operate in profound interdependence.

The central idea running throughout the study is that the human factor remains the most resilient source of adaptability, safety, and organizational learning-regardless of the degree of digitalisation or automation. In an era of autonomous systems, cognitive platforms, and XR technologies, it is human qualities-empathy, critical thinking, cultural intelligence, leadership maturity, and social responsibility-that constitute the invisible yet decisive architecture of effectiveness. The research demonstrates that individuals are not passive recipients of technological change, but active co-creators of it.

The empirical analysis confirmed that individual competencies-social and emotional intelligence, technological readiness, leadership behaviour, and stress resilience-significantly shape effectiveness and adaptation among professionals in the waterborne transport sector. At the team level, trust, communication, and constructive conflict management emerged as essential determinants of collective performance. An organizational culture oriented toward learning, innovation, and support was shown to enhance adaptation to Industry 5.0, while contemporary educational practices function as a transformative mechanism that reproduces these processes in future generations of specialists.

Based on this systemic logic, the **Hybrid Human Factor Model for Industry 5.0** was developed-a conceptual framework integrating psychological, social, cultural, technological, and educational components. The model is not merely an analytical construct but a practical tool for organizations seeking to cultivate leadership capacity, strengthen team dynamics, build cultures of trust, and prepare their human capital for the demands of the new industrial era.

The Executive Education and Executive Training programmes presented in the monograph demonstrate the practical applicability of the model and offer concrete pathways for developing competencies at individual, team, and organizational levels. They confirm that the human-centred approach is not an abstract theoretical notion but a viable strategy for improving safety, motivation, innovation capacity, and professional resilience within the maritime industry.

This monograph contributes to scientific and applied knowledge in organizational behaviour by:

• defining a contemporary conceptual framework for human-centred management in the era of Industry 5.0;

• substantiating the interaction between technology and the human factor as a mutually reinforcing process;

• providing empirical evidence of the influence of competencies and culture on adaptability and effectiveness;

• developing applicable educational and managerial models for human-capital development within the waterborne transport sector.

The study also identifies directions for future research. Further inquiry is needed into the integration of AI systems with human decision-making, the impact of XR technologies on training, new models of psychological safety in digitalised teams, and the assessment of ESG-related behaviours in the maritime industry. These areas delineate the next steps toward expanding this scientific field.

In conclusion, this monograph demonstrates that in the era of Industry 5.0, technological progress is inseparable from the humanisation of organizations. Human-centred transformation is not an optional enhancement but a foundational principle for sustainable and ethical development in the maritime sector. The human being-with their intelligence, emotions, culture, experience, and values-remains the most important navigational instrument of any system. The future of waterborne transport will therefore depend not only on the technologies we design, but on the people who operate them, coordinate them, and give them meaning.

CONTRIBUTIONS OF THE MONOGRAPH

This monograph offers a comprehensive theoretical, methodological, empirical, and practical contribution to the study of organizational behaviour in the waterborne transport sector within the context of Industry 5.0. The contributions can be systematised into four principal groups: theoretical, methodological, empirical, and practical-applied.

I. Theoretical Contributions

1. An expanded theoretical framework of organizational behaviour in waterborne transport has been developed, integrating psychological, social, technological, and cultural dimensions and systematising the influence of Industry 5.0 on the human factor.
2. A conceptual interpretation of the human factor as a strategic resource in the new industrial paradigm is introduced, positioning competencies, leadership, and culture not only as organizational assets but as drivers of sustainability, innovation, and safety.
3. A new understanding of organizational behaviour as the "living tissue" of the organizational system is substantiated, conceptualising human–technology–organization interaction as a dynamic, interdependent, and non-linear process.
4. A new interpretation of team dynamics in high-technology, multicultural, and high-risk environments characteristic of the maritime industry is developed, emphasising the roles of trust, psychological safety, and intercultural intelligence.
5. A theoretical model linking organizational culture with technological transformation is proposed, viewing culture as a stabilising mechanism within processes of digitalisation, automation, and environmental reform.

II. Methodological Contributions

1. A humanistic–pragmatic methodological framework has been developed, combining quantitative and qualitative approaches and tailored to the specifics of the waterborne transport sector.
2. An integrative model for analysing the human factor-combining individual, team, organizational, and educational levels into a single analytical system-has been introduced for the first time in this sector.
3. Modern statistical methods (correlation analysis, multiple linear regression, visualised analytical dependencies) have been applied, enabling the quantitative measurement of key competencies and their influence on professional effectiveness and adaptation.
4. The methodology bridges theoretical concepts with empirical verification, ensuring the validity, reliability, and internal coherence of the research design.

III. Empirical Contributions

1. The first systematic empirical analysis of the human factor in waterborne transport within the context of Industry 5.0 has been conducted, encompassing individual, team, organizational, and educational levels.
2. Statistically significant effects of soft skills and technological readiness on the professional effectiveness and adaptability of maritime specialists have been demonstrated.
3. The central role of trust, communication, and conflict management as leading predictors of team effectiveness in multicultural environments has been established.
4. The relationship between organizational culture and adaptation to Industry 5.0-including innovation, learning, and resilience-has been empirically confirmed.
5. An integrative empirical model has been developed, verifying the central hypothesis that the human factor is the systemic driver of organizational transformation.

IV. Practical-Applied Contributions

1. The Hybrid Human Factor Model for Industry 5.0 is presented as a conceptual and practical framework for management, training, and human-capital development in waterborne transport.
2. Three Executive Education programmes ("Soft Skills for Maritime Leaders," "Intercultural Leadership," "Organizational Culture and Change Management") have been developed, translating the scientific concept into training practice.
3. Three Executive Training formats have been introduced, based on experiential, coaching, and XR-supported methodologies that develop leadership, team, and cultural competencies.
4. Concrete organizational guidelines for improving culture, team interactions, and leadership behaviour in maritime companies have been proposed.
5. An applied lifelong-learning framework has been developed for use by maritime academies, port authorities, shipping companies, and logistics operators.
6. The monograph provides a practical toolkit for managers, HR specialists, training departments, and academic institutions seeking to develop human potential in the context of Industry 5.0.

Summary of Contributions

This monograph presents one of the first comprehensive, multilayered, and integrative scientific models of the human factor in waterborne transport within the context of Industry 5.0. It brings together theory, methodology, empirical evidence, and practical training solutions into a coherent conceptual system that advances both academic knowledge and the strategic capacity of the maritime industry.

Table Contr. 1 Synthesis of the Scientific Contributions of the Monograph

Category of Contribution	Specific Contribution	Nature of the Contribution
I. Theoretical Contributions	1. Development of an integrative conceptual framework for Organizational Behaviour in the context of Industry 5.0.	A new theoretical model combining psychological, social, technological, and ethical perspectives.
	2. Introduction of a human-centric interpretation of technological transformation in the maritime transport sector and formulation of a new perspective on human–technology interaction.	Extension and refinement of existing theories through a humanistic lens.
	3. Development of a multidimensional model of soft skills as a strategic driver of effectiveness in high-technology work environments.	A new classification model of soft skills tailored to the maritime industry.
	4. Advancement of leadership theory through the synthesis of transformational and human-centric leadership paradigms aligned with Industry 5.0 requirements.	Conceptual contribution through the integration of two modern leadership paradigms.
	5. Formulation of a conceptual model linking organizational culture and technological transformation, positioning culture as a stabilizing mechanism during digitalization and automation.	Expansion of established models (Schein, Argyris, Senge) with new contextual insights.
II. Methodological Contributions	6. Development of a four-level research model (individual, team, organizational, educational) for assessing the human factor in Industry 5.0.	A new systemic methodological approach.
	7. Formulation and empirical verification of hypotheses related to leadership, soft skills, organizational culture, and adaptability.	Methodological innovation through an integrative mixed-methods approach.
	8. Creation of criteria and indicators for measuring the human factor and organizational readiness for Industry 5.0.	Practically applicable methodological instruments.
	9. Development of a method for empirical validation of training models and educational programs.	A transferable and replicable validation framework.

Category of Contribution	Specific Contribution	Nature of the Contribution
III. Empirical Contributions	10. Implementation of the first systematic empirical analysis of the human factor in maritime transport within the Industry 5.0 paradigm.	Introduction of new empirical evidence for the sector.
	11. Statistical confirmation of the influence of soft skills and technological readiness on professional effectiveness and adaptability.	Evidence-based identification of key predictors of effectiveness.
	12. Identification of trust, communication, and conflict management as core determinants of team effectiveness in multicultural environments.	Empirical support for new team-level behavioural dynamics.
	13. Empirical confirmation of the relationship between organizational culture and adaptability to Industry 5.0 (innovation, learning, resilience).	Validation of the cultural dimension of digital transformation.
	14. Development of an integrative empirical model that verifies the main hypothesis that the human factor functions as the systemic driver of organizational transformation.	A consolidated empirical model supporting the research framework.
IV. Practical and Applied Contributions	15. Creation of the Hybrid Human Factor Model for Industry 5.0 – a conceptual and applicable framework for management, education, and human-capital development in maritime transport.	The central original applied contribution of the monograph.
	16. Development of three Executive Education programs.	Directly applicable to training centers and maritime organizations.
	17. Development of three Executive Training formats using experiential, coaching-based, and XR-enhanced methodologies.	Innovative training formats for leadership and team development.
	18. Formulation of organizational guidelines for strengthening culture, leadership behaviour, and team interaction in maritime companies.	Practical recommendations for managers and HR professionals.
	19. Establishment of an applied lifelong-learning framework for maritime academies, port authorities, shipping companies, and logistics operators.	Applicable educational architecture with sector-wide relevance.

LIST OF LITERATURE

Alfredo, R., Echeverria, V., Jin, Y., Yan, L., Swiecki, Z., Gašević, D., & Martinez-Maldonado, R. (2023). Human-centred learning analytics and AI in education: A systematic literature review (arXiv:2312.12751) [Preprint]. arXiv. https://doi.org/10.48550/arXiv.2312.12751

Amdam, R. P. (2020). Executive education. In *Oxford Research Encyclopedia of Business and Management*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190224851.013.205

American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct.* https://www.apa.org/ethics/code/

Angelova, A., & Belev, B. (2023). The need for development of a modern laboratory in meteorology for the purposes of training mariners. In *Proceedings of the 28th International Maritime Lecturers' Association Conference (IMLA 28) & the 33rd International Maritime English Conference (IMEC 33)* (pp. 7–13). ISBN 978-619-7428-96-4.

Antwerp Maritime Academy. (2023). *Digital project of the year: VR safety simulation*. AMA Publications.

Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Addison-Wesley.

Argyris, C., & Schön, D. A. (1996). *Organizational learning II: Theory, method, and practice*. Addison-Wesley.

Atanasova, C. (2024). *Transformatsiya na morskoto obrazovanie – rolyata na digitalnite tehnologii* [Transformation of maritime education – The role of digital technologies]. Varna: IK Largo City

Atanasova, C. (2023). Transforming maritime education for a digital industry. *Strategies for Policy,* 31(6s). https://doi.org/10.53656/str2023-6s-1-mar

Atanasova, C., & Teofilova, T. (2023). Challenges to the professional training of cruise industry employees in Bulgaria. In *Proceedings of the International Association of Maritime Universities (IAMU) Conference*

Avolio, B. J., & Gardner, W. L. (2005). Authentic leadership development: Getting to the root of positive forms of leadership. *The Leadership Quarterly, 16*(3), 315–338. https://doi.org/10.1016/j.leaqua.2005.03.001

Autsadee, Y., Jeevan, J., Bin Othman, M. R., & Mohd Salleh, N. H. B. (2025). Maritime Society 5.0: A global transition on human economy and civilisation for maritime sustainability. *Australian Journal of Maritime & Ocean Affairs, 17*(1), 1–26. https://doi.org/10.1080/18366503.2023.2287872

Babbie, E. (2020). *The practice of social research* (15th ed.). Cengage.

Bakalova, R. (2024). Trends in the development of transport logistics: European transport policy. *International Journal of Global Economic Light*, *10*(5), 13–15. https://doi.org/10.36713/epra16711

Bass, B. M. (1990). *Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications* (3rd ed.). Free Press.

Beard, C., & Wilson, J. (2018). *Experiential learning: A handbook for education, training and coaching*. Kogan Page.

Belev, B., Tsvetkov, M., Daskalov, S., Koritarov, T., & Atanasova, K. (2017). *Potentsialyt na choveshkiya element za rabota v ekip kato faktor za ustoychivost v razvitieto na morskiya sektor* [The potential of the human element for teamwork as a factor for sustainability in the development of the maritime sector]. *Nauchni trudove – VVMU N. Y. Vaptsarov, 32*, 12–18.

Bertrand, G. (2023). *Personality, emotional intelligence and the future of leadership in US business* [Doctoral dissertation, Saint Leo University].

Bican, P. M., & Brem, A. (2020). Digital business model, digital transformation, digital entrepreneurship: Is there a sustainable "digital"? *Sustainability, 12*(13), 5239.

Boyatzis, R. E., & McKee, A. (2005). *Resonant leadership: Renewing yourself and connecting with others through mindfulness, hope, and compassion*. Harvard Business School Press.

Brand, M., Tiberius, V., Bican, P. M., & Brem, A. (2021). Agility as an innovation driver: Towards an agile front end of innovation framework. *Review of Managerial Science*, *15*(1), 157-187. https://doi.org/10.1007/s11846-019-00373-0

Breque, M., De Nul, L., & Petridis, A. (2021). *Industry 5.0: Towards a sustainable, human-centric and resilient European industry.* European Commission, Directorate-General for Research and Innovation. https://doi.org/10.2777/308407

British Educational Research Association. (2018). *Ethical guidelines for educational research* (4th ed.). https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2018-online

Brookfield, S. (2017). *Becoming a critically reflective teacher* (2nd ed.). Jossey-Bass.

Bryman, A. (2015). Social research methods (5th ed.). Oxford University Press.

Burke, C. S., & Wilson, K. A. (2002). Crisis management team (CMT): Leveraging the science of team performance under stress. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 46*(3), 546–550. Human Factors and Ergonomics Society. https://doi.org/10.1177/154193120204600369

D'Augusta, V., Longo, F., Manfredi, K. A., Mirabelli, G., Nicoletti, L., Solina, V., & Talarico, S. (2024). Enhancing maritime training: The role of VR in ship bridge simulators – The CAL-TEK case study. In *Proceedings of the 26th International Conference on Harbor, Maritime and Multimodal Logistic Modeling & Simulation* (I3M 2024), 012. https://doi.org/10.46354/i3m.2024.hms.012

Cameron, K. S., & Quinn, R. E. (2011). *Diagnosing and changing organizational culture: Based on the competing values framework* (3rd ed.). Jossey-Bass.

Carayannis, E. G., & Morawska-Jancelewicz, J. (2022). *The futures of Europe: Society 5.0 and Industry 5.0 as driving forces of future universities.* Journal of the Knowledge Economy, 13(4), 3445–3471. https://doi.org/10.1007/s13132-021-00854-2

Carmeli, A., & Schaubroeck, J. (2007). The influence of leaders' and other referents' normative expectations on individual involvement in creative work. *The Leadership Quarterly, 18*(1), 35–48. https://doi.org/10.1016/j.leaqua.2006.11.001

Cherniss, C. (2010). Emotional intelligence: Toward clarification of a concept. *Industrial and Organizational Psychology,* 3(2), 110–126. https://doi.org/10.1111/j.1754-9434.2010.01209.x

Colledani, D., Robusto, E., & Anselmi, P. (2024). Assessing key soft skills in organizational contexts: Development and validation of the multiple soft skills assessment tool. *Frontiers in Psychology*, *15*, 1405822. https://doi.org/10.3389/fpsyg.2024.1405822

Conev, I., & Dimitrakiev, D. (2023). Use of modern technologies at Naval Academy Varna. In *Proceedings of the International Association of Maritime Universities (IAMU) Conference*.

Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE.

Creswell, J. W., & Plano Clark, V. L. (2023). Designing and conducting mixed methods research (4th ed.). SAGE.
Deardorff, D. K. (2006). Identification and assessment of intercultural competence. *Journal of Studies in International Education, 10*(3), 241–266. https://doi.org/10.1177/1028315306287002
Demir, K. A., Döven, G., & Sezen, B. (2019). Industry 5.0 and human–robot co-working. *Procedia Computer Science, 158,* 688–695. https://doi.org/10.1016/j.procs.2019.09.104
Denzin, N. K., & Lincoln, Y. S. (Eds.). (2018). *The SAGE handbook of qualitative research* (5th ed.). SAGE.
Dewey, J. (1938). *Experience and education*. Macmillan.
Dimitrakiev, D., Stankov, V., & Atanasova, C. (2023). Simulator training – Unique powerful instrument for educating, skills creating, mitigating skills and resilience creating. *Strategies for Policy in Science and Education*, 31(6C), 103–111.
Dimitrakieva, S., & Dimitrova, B. (2023). Challenges to the education of maritime professionals based on digital platforms. In *Proceedings of the International Conference of Maritime Science & Technology* (pp. 43–51).
Dimitrov, N. (2022). *Upravlenie na riska za sigurnostta v Tsentara za kompetentnost KVAZAR* [Security risk management in the Center of Competence KVAZAR]. VVMU Nikola Y. Vaptsarov
Earley, P. C., & Ang, S. (2003). *Cultural intelligence: Individual interactions across cultures.* Stanford University Press.
Edmondson, A. C. (2019). *The fearless organization: Creating psychological safety in the workplace for learning, innovation, and growth*. Wiley.
EFMD. (2020). *The future of work and leadership development* (Special supplement). *Global Focus*. https://www.globalfocusmagazine.com/wp-content/uploads/2020/10/EFMD_GF_1802_FWF-supplement.pdf
Ekman, P., & Friesen, W. V. (2003). *Unmasking the face: A guide to recognizing emotions from facial clues*. Ishk.
European Commission. (2021). *Industry 5.0: Towards a sustainable, human-centric and resilient European industry.* Publications Office of the European Union. https://doi.org/10.2777/308407
European Commission. (2024). *AI and extended reality in higher education*. Publications Office of the European Union.
European Commission. (2026). *The future employment impact of artificial intelligence and emerging digital technologies in Europe*. Publications Office of the European Union. https://doi.org/10.2767/5306605
European Union. (2016). *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (General Data Protection Regulation)*. *Official Journal of the European Union, L* 119. https://eur-lex.europa.eu/eli/reg/2016/679/oj
Ferdman, B. M. (2020). *Inclusive leadership: Transforming diverse lives, workplaces, and societies*. Routledge.
Field, A. P. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE.
Flick, U. (2018). *An introduction to qualitative research* (6th ed.). SAGE.
Freire, P. (1970). Pedagogy of the oppressed. Continuum.
Friga, P. N., Bettis, R. A., & Sullivan, R. S. (2003). Changes in graduate management education. *Academy of Management Learning & Education, 2*(3), 233–249.
Garvin, D. A. (1993). Building a learning organization. Harvard Business Review, 71(4), 78–91.
Gibson, J. L., Ivancevich, J. M., Donnelly, J. H., & Konopaske, R. (2012). *Organizations: Behavior, Structure, Processes* (14th ed.). McGraw-Hill Education.

Goleman, D. (2020). Emotional intelligence: Why it can matter more than IQ (25th anniv. ed.). Bloomsbury Publishing.
Goleman, D., Boyatzis, R. E., & McKee, A. (2013). *Primal leadership: Unleashing the power of emotional intelligence*. Harvard Business Press.
Goleman, D. (2006). The socially intelligent. *Educational leadership*, *64*(1), 76-81.
Goleman, D., & Boyatzis, R. (2017). Emotional intelligence has 12 elements. Which do you need to work on. *Harvard business review*. https://hbr.org/2017/02/emotional-intelligence-has-12-elements-which-do-you-need-to-work-on
Gramchev, B. M., & Dimitrakieva, S. R. (2022). *Osnovni nasoki pri interventsiyata na ekipnite protsesi s tsel povishavane na ekipnata efektivnost v savremennite organizatsii* [Main guidelines for intervening in team processes to enhance team effectiveness in modern organizations]. In *Logistikata v usloviyata na kriza: Predizvikatelstva i resheniya* (pp. 197–205). Nauka i ikonomika.

Grancharova, V. (2021). Challenges to the multimodal transport networks based on sustainable growth in the volume of containerized cargoes. Pedagogika – Pedagogy, 93(7s), 53–64. https://doi.org/10.53656/ped21-7s.04chal

Grancharova, V. (2023). *Osnovi na morskata transportna sistema – chast I* [Fundamentals of the maritime transport system – Part I]. Steno.
Greene, J. C. (2007). *Mixed methods in social inquiry*. Jossey-Bass.
Haas, M., & Mortensen, M. (2016). The secrets of great teamwork. *Harvard Business Review*. https://hbr.org/2016/06/the-secrets-of-great-teamwork
Hair, J. F., Jr., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage.
Hannah, S., Uhl-Bien, M., Avolio, B., & Cavarretta, F. (2021). Ethical leadership in complex environments. *The Leadership Quarterly, 32*(6), 101538. https://doi.org/10.1016/j.leaqua.2021.101538
Hariyani, D., Hariyani, P., & Mishra, S. (2025). The role of leadership in sustainable digital transformation of the organization. *Sustainable Futures*, *10*, 101130. https://doi.org/10.1016/j.sftr.2024.101130
Harvard Business Impact. (2024). *Leadership Competencies for the Future: Balancing Emotional, Digital, and Strategic Intelligence*. Harvard Business Publishing.
Harvard Business Publishing. (2024). 2024 Global Leadership Development Study. https://www.harvardbusiness.org/insight/2024-global-leadership-development-study/
Hasani, N., Hosseini, A., Ashjazadeh, Y., Diederichs, V., Ghotb, S., Riggio, M., & Nasir, V. (2025). Outlook on human-centred design in Industry 5.0: Towards mass customisation, personalisation, co-creation, and co-production. *International Journal of Sustainable Engineering*, *18*(1), 2486343. https://doi.org/10.1080/19397038.2024.2486343

Hiatt, J. (2006). *ADKAR: A model for change in business, government and our community.* Prosci Research.
Hofstede, G. (2010). *Cultures and Organizations: Software of the mind* (3rd ed.). McGraw-Hill.
Hollnagel, E. (2017). *Safety-II in practice: Developing the resilience potentials*. Routledge.
International Chamber of Commerce, & European Society for Opinion and Market Research. (2017). *International code on market, opinion, and social research and data analytics*. ICC/ESOMAR. https://esomar.org/codes-and-guidelines

Ivanov, P., & Petrescu, D. (2024). Simulation-based learning in maritime education: Integrative effects of AI and human factors. *Journal of Maritime Studies*, 12(2), 54–72.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14–26. https://doi.org/10.3102/0013189X033007014
Kalinov, K. (2016). *Organizatsionna kultura* [Organizational culture]. Dangrafik.
Kalinov, K. (2017). *Aspekti na organizatsionnata teoriya: Na prost ezik za kompleksnostta na sistemite* [Aspects of organizational theory: In simple terms about the complexity of systems]. Dangrafik.
Kalinov, K. (2022). Modernoto obrazovanie – tova, ot koeto vseki razbira [Modern education – The thing everyone understands]. *Sigurnost i otbrana, 1*(1), 85–95.
Kalinov, K., Mednikarov, B., & Kanev, D. (2014). *Liderstvo i ekipnost v koraboplovaneto* [Leadership and teamwork in shipping]. Sofia: E-Litera Soft.
Kalinov, K., Tsvetkov, M., & Bakalov, I. (2017). Using engine room simulators for training and exercises in fighting fires for marine training command staff in the virtual vessel type Fregat. In *Proceedings of the 13th International Conference on Engine Room Simulators (ICERS 13)* (pp. 126–128).
Kalinova, Zh. (2022). Balansat mezhdu upravlyaemost i gavkavost na organizatsiite [The balance between manageability and flexibility of organizations]. *Mechanics, Transport, Communications, 20*(1), Article 2190. http://www.mtc-aj.com
Kalinova, Zh. (2019). The adaptation as a driver for organizational ageing. *In Sbornik s dokladi ot Doktorantska nauchna konferentsiya* [Proceedings of the Doctoral Scientific Conference] (pp. 92–99).
Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.
Kapp, K. M. (2012). What is gamification? In *The gamification of learning and instruction: Game-based methods and strategies for training and education* (pp. 1-23). John Wiley & Sons.
Keller, J., Bless, H., Blomann, F., & Kleinböhl, D. (2021). *The psychology of flow under pressure.* Journal of Applied Psychology, 106(4), 589–604. https://doi.org/10.1037/apl0000813
Kim, W. C., & Mauborgne, R. A. (2017). *Blue ocean leadership (Harvard business review classics)*. Harvard Business Review Press.
Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
Kolb, A., & Kolb, D. (2017). *The experiential educator: Principles and practices of experiential learning*. EBLS Press.
Kotter, J. P. (2012). *Leading Change*. Harvard Business Review Press.
Koritarov, T. (2025). *Savremennata morska podgotovka i tekhnologichniyat prekhod v koraboplavaneto: Adaptatsiya i perspektivi* [Modern maritime training and the technological transition in shipping: Adaptation and prospects]. LARGO CITY Publishing House Ltd.
Koritarov, T., & Dimitrakiev, D. (2025). Adaptive learning technologies and personalized assessment in maritime education. In *Proceedings of the Knowledge, Science, Innovation, Technology Conference* (pp. 1301–1323).
Krastev, D. (2022). *Organizatsiya na kibersigurnostta v koraboplovaneto* [Organization of cybersecurity in shipping]. Steno.
Lechner, A., & Mortlock, J. M. T. (2022). How to create psychological safety in virtual teams. *Organizational Dynamics, 51*(2), Article 100849. https://doi.org/10.1016/j.orgdyn.2021.100849lom
Lepeley, M.-T., Beutell, N. J., Abarca, N., & Majluf, N. (Eds.). (2021). *Soft skills for human-centered management and global sustainability*. Routledge.
Lepeley, M. T., Morales, O., Essens, P., Beutell, N., & Majluf, N. (2021). *Human centered organizational culture*. Routledge.

Lewin, K., Lippitt, R., & White, R. K. (1939). Patterns of aggressive behavior in experimentally created social climates. *Journal of Social Psychology, 10*(2), 271–299.
Likert, R. (1961). *New patterns of management*. McGraw-Hill.
Livermore, D. A. (2015). *Leading with cultural intelligence: The real secret to success* (2nd ed.). AMACOM.
Longo, F., Padovano, A., & Umbrello, S. (2020). Value-oriented and ethical technology engineering in industry 5.0: A human-centric perspective for the design of the factory of the future. *Applied Sciences, 10*(12), 4182. https://doi.org/10.3390/app10124182
Luthans, F., & Avolio, B. J. (2003). Authentic leadership: A positive developmental approach. In K. S. Cameron, J. E. Dutton, & R. E. Quinn (Eds.), *Positive organizational scholarship* (pp. 241–261). Berrett-Koehler
Lutzkanova, S., Mednikarov, B., Kalinov, K., & Stoyanov, V. (2024). Current trends in maritime education: Transition and transformation from traditions to modern times. In *Proceedings of the IAMU Conference* (pp. 85–90). https://aga24.maritime.edu/wp-content/uploads/IAMU_proceedings.pdf
Maersk Training. (2024). *Future Leaders: Immersive Learning and Human Factors*. Maersk Reports.
Maersk Training. (n.d.). *VR enabled future leaders foundation program*. https://www.maersktraining.com/news-and-insights/news/vr-enabled-future-leaders-foundation-program
Miyusov, M. V., Nikolaieva, L. L., & Smolets, V. V. (2022). *The future perspectives of immersive learning in maritime education and training*. *Transactions on Maritime Science, 11*(02), 14-14. https://doi.org/10.7225/toms.v11.n02.014
Mayer, J. D., Salovey, P., & Caruso, D. R. (2008). Emotional intelligence: New ability or eclectic traits?. *American Psychologist*, *63*(6), 503 –517. https://doi.org/10.1037/0003-066X.63.6.503
Maxwell, J. C. (2010). *A leader's heart: 365-day devotional journal*. Thomas Nelson.
Maxwell, J. C. (2011). *The 360 degree leader with workbook: Developing your influence from anywhere in the organization*. Thomas Nelson.
Maxwell, J. C. (2024). *High road leadership: Bringing people together in a world that divides*. Simon and Schuster.
Maxwell, J. C. (2023). *The 16 undeniable laws of communication: Apply them and make the most of your message*. Simon and Schuster.
McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. Penguin.
McGonigal, J. (2016). *SuperBetter: The power of living gamefully*. Penguin.
McKinsey & Company. (2025). 2025 learning trends analysis: Reimagined – A 2025 perspective on evolving trends in L&D. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/people%20in%20progress%20blog/learning%20trends%202025/2025_mckinsey%20learning%20perspective.pdf
Mednikarov, B., Stoyanov, N., & Kalinov, K. (2009). *Challenges to education and training in the field of harbor protection security*. Maritime Transport & Navigation Journal, 1(1), 46–54.
Mednikarov, B., Lutzkanova, S., & Chesnokova, M. (2022). Enhancing "soft skills" management for maritime and shipping business personnel using interactive educational methods. In *Proceedings of the International Association of Maritime Universities (IAMU) Conference* (pp. 247–252).
Mintzberg, H. (2004). *Managers not MBAs.* Berrett-Koehler.
Moldoveanu, M., & Narayandas, D. (2019). The future of leadership development. *Harvard Business Review*. https://hbr.org/2019/03/the-future-of-leadership-development

Mor Barak, M. E. (2017). *Managing Diversity: Toward a globally inclusive workplace* (4th ed.). SAGE.
Morgan, D. L. (2014). *Integrating qualitative and quantitative methods: A pragmatic approach*. SAGE.
Nahavandi, S. (2019). Industry 5.0-A human-centric solution. *Sustainability, 11*(16), 4371. https://doi.org/10.3390/su11164371
Narleva, K., Gancheva, Y., & Narlev, Y. (2024). The role of soft skills and maritime education in the digitisation process. In *Proceedings of the International Scientific and Practical Conference "Human Resource Management"* (Vol. 1, pp. 192–201).
Narleva, K., & Velinov, S. (2024). *Digitalization in the maritime industry: Opportunities and challenges*. Publishing Center of Varna Free University "Chernorizets Hrabar".
Nedeva, R. (2021). *Vliyanie na sotsialnata izolatsiya vŭrkhu nivoto na rezilians na obuchayemite vŭv VVMU "N. Y. Vaptsarov"* [The impact of social isolation on the level of resilience of trainees at Nikola Vaptsarov Naval Academy]. *Filosofiya, 30*(3), 317–324.
Nedeva, R., & Stavrev, D. (2023). Building a system for evaluating and developing professionally significant qualities of maritime professionals: Possibilities to include apparatus methods. In *Proceedings of the University of Ruse* (Vol. 62).
Nikolov, Zh. (2022). *Komunikatsionno-informatsionnata sistema na Voennomorskite sili: Sastoyanie i perspektivi* [The communication and information system of the Naval Forces: State and prospects]. Bulair 20A.
Nikolov, Zh. (2024). Vazmozhnosti za podobryavane na komunikatsionno-informatsionnoto osiguryavane na Voennomorskite sili [Opportunities for improving the communication and information support of the Naval Forces]. *Izvestiya na Sayuza na Uchenite – Varna. Morski nauki*, 79–82.
Nohria, N., & Khurana, R. (Eds.). (2010). *Handbook of leadership theory and practice*. Harvard Business Press.
Northouse, P. G. (2021). *Leadership: Theory and practice* (9th ed.). SAGE.
Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (7th ed.). McGraw-Hill Education. https://doi.org/10.4324/9781003117452
Pedersen, P. B., & Thomas, C. D. (2020). Cross-cultural competence: A field guide for developing global leaders and managers (3rd ed.). Routledge.
Pentland, A. (2015). *Social physics: How social networks can make us smarter*. Penguin Books.
Pham, H. S. T., & Li, S. B. (2025). Towards Industry 5.0: A conceptual model for leading organisational change in digital age. Journal of Organizational Change Management. https://doi.org/10.1108/JOCM-03-2025-0264
Pratiwi, E. C., Purwanto, F., & Irfan, M. (2025). Leadership 4.0: How transformational leadership shapes employee engagement in the era of Industry 5.0. Jurnal Informatika Ekonomi Bisnis, 7(2), 277–281. https://doi.org/10.37034/infeb.v7i2.1139
Prime, J., & Salib, E. (2014). *Inclusive leadership: The view from six countries*. Catalyst.
PwC. (2023). *Seeing is believing: The impact of virtual reality on corporate training*. PwC.
Rautrao, R. R., & Nille, N. S. (2025). *Organizational behavior*. Ashok Yakkaldevi. https://books.google.com.ph/books?id=AbI7EQAAQBAJ
Reason, J. (1997). *Managing the risks of organizational accidents*. Ashgate.
Riedl, C., Kim, Y. J., Gupta, P., Malone, T. W., & Woolley, A. W. (2021). Quantifying collective intelligence in human groups. *Proceedings of the National Academy of Sciences, 118*(21), e2005737118. https://doi.org/10.1073/pnas.2005737118
Robbins, S. P., & Judge, T. A. (2019*). Organizational behavior* (18th ed.). Pearson Education.
Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Schein, E. H. (2017). *Organizational culture and leadership* (5th ed.). Wiley.
Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books
Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization* (Rev. ed.). Doubleday.
Senge, P. M. (1996). Leading learning organizations. *Training & development*, *50*(12), 36-37.
Shore, L. M., Cleveland, J. N., & Sanchez, D. (2011). Inclusive workplaces: A review and model. *Human Resource Management Review, 21*(4), 311–326.
Siemens, G. (2008). Learning and knowing in networks: Changing roles for educators and designers.
Silverman, D. (Ed.). (2020). *Qualitative research* (5th ed.). SAGE.
Sima, V., Gheorghe, I. G., Subić, J., & Nancu, D. (2020). Influences of the industry 4.0 revolution on the human capital development and consumer behavior: A systematic review. *Sustainability*, *12*(10), 4035. https://doi.org/10.3390/su12104035
Sivkov, Y. (2022). *Digitalniyat universitet: Pouki ot praktikata na Visshe voennomorsko uchilishte "Nikola Vaptsarov"* [The digital university: Lessons from the practice of Nikola Vaptsarov Naval Academy]. Nikola Vaptsarov Naval Academy.
Sivkov, Y. (2020). Digitalni umeniya na spetsialistite v morskata industriya: Tendentsii v razvitieto [Digital skills of specialists in the maritime industry: Development trends]. *Strategii na obrazovatelnata i nauchnata politika, 28*(3), 307–319.
Sotirov, M., Petrova, V., & Tsvetkov, M. (2025, June 27). Application of AI in gamified learning objects for cybersecurity forensics. In *Proceedings of the 2025 9th International Symposium on Innovative Approaches in Smart Technologies (ISAS)* (pp. 1–6). IEEE. https://doi.org/10.1109/ISAS66241.2025.11101832
Sotirov, M., Petrova, V., & Nikolova-Sotirova, D. (2024). Learning through gamification: A case study on the development and integration of a university educational serious game. In *Proceedings of the 2024 International Conference Automatics and Informatics (ICAI)* (pp. 313–318). IEEE. https://doi.org/10.1109/ICAI63388.2024.10851688
Sotirov, M., Petrova, V., & Nikolova-Sotirova, D. (2024). Personalized gamified education: Feedback mechanisms and adaptive learning paths. In *Proceedings of the 8th International Symposium on Innovative Approaches in Smart Technologies (ISAS)* (pp. 316–321). IEEE. https://doi.org/10.1109/ISAS64331.2024.10845384
Spies, P. (2025). Ethical leadership for a sustainable Industry 5.0. *European Journal of Industrial Leadership, 5*(1), 1–14.
Stefanova, M. (2025). *Sustainable logistics services of food provisions on merchant ships: Potential for reducing environmental damage*. MDPI. https://doi.org/10.3390/books978-3-7258-3269-9
Stefanova, M. (2022). Research methodology for quality and risk management in logistics. In *Integrating quality and risk management in logistics*. IntechOpen. https://doi.org/10.5772/intechopen.103731
Stefanova, M. (2023). Social responsibility in the public sector - Opportunities and prospects. *Voenen Zhurnal,* 130, 389–396.
Stefanova, M., & Kanev, D. (2022). The impact of process innovations on maritime transport services in Bulgaria. In *Proceedings of the International Association of Maritime Universities (IAMU) Conference*.
Stefanova, M., Kanev, D., & Agai, L. (2025). Forestry logistics and sustainability: Adaptation to price challenges. In Z. Meloska & M. M. Janakieska (Eds.), *WoodEMA 2025 – Wood for the future: Integrating sustainability across industries: Proceedings of scientific papers* (pp. 133–138). WoodEMA.

Stefanova, M., Kanev, D., & Mednikarov, B. (2023). The impact of master's degree programmes in logistics on career development and professional performance. In *Proceedings of the International Association of Maritime Universities (IAMU) Conference*.
Stefanova, M., Hristov, A., Dilova, I., & Govedarova, H. (2025). Challenges in teaching innovative practices in logistics and maritime transport: Energy efficiency, Industry 5.0, and sustainable fuels. *International Journal of Innovative Science and Research Technology*, 10(1). https://doi.org/10.5281/zenodo.14737962
Stoyanova, A., & Stefanova, M. (2025). Implementing artificial intelligence in public administration: Managing challenges, risks, and opportunities in the contemporary context. In *AI-driven tools for sustainable public administration: Identification of potential barriers to AI adoption in public administration including technological* (pp. 153–188). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8372-8.ch006
Stoyanov, N. (2018). Zona "Morski transportni marshruti i trafik pototsi" [Zone "Maritime transport routes and traffic flows"] (Chapter 5). In Funktsionalno zonirane na natsionalnite morski prostranstva za sazdavane na informatsionna sistema za upravlenie na kraybrezhnata zona [Functional zoning of national maritime spaces for the creation of an information system for coastal zone management]. Nikola Vaptsarov Naval Academy.
Stoyanov, N. (2017). Riskove i zaplahi za sigurnostta na vodnata transportno-prenosna sistema [Risks and threats to the security of the maritime and inland waterway transport and transmission system]. Terra Balkanika.
Stoyanov, V. (2008). *Chovekat v organizatsiyata – psihologichen analiz* [The human in the organization – A psychological analysis]. IK PSIDO.
Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.
Tashakkori, A., & Teddlie, C. (Eds.). (2010). *SAGE handbook of mixed methods in social & behavioral research* (2nd ed.). SAGE.
Tyagi, A. K., Priya, R. L., Mishra, A. K., & Balamurugan, G. (2023). *Industry 5.0: Potentials, issues, opportunities, and challenges for Society 5.0.* In A. K. Tyagi (Ed.), *Privacy preservation of genomic and medical data* (pp. 409–432). Wiley. https://doi.org/10.1002/9781394213726.ch17
van der Loos, M. J. H. M., Rietveld, C. A., Eklund, N., Koellinger, P. D., Rivadeneira, F., Abecasis, G. R., … Thurik, A. R. (2013). *The molecular genetic architecture of self-employment.* PLoS ONE, 8(4), e60542. https://doi.org/10.1371/journal.pone.0060542
Velikova, S., Nedeva, R., & Stoyanov, V. (2024). Psihologichno osiguryavane na korabni ekipazhi: Po primera na balgarskite Voennomorski sili [Psychological support of ship crews: The case of the Bulgarian Navy]. *Spisanie na Druzhestvoto na Psikholozite v Republika Bulgaria*, 1.
Watkins, W. A., Dickens, B. S., Elfman, M. E., & Green, J. D. (2011). *The gamification of training: A new language for a new generation* (Report No. LA-UR-11-03539). Los Alamos National Laboratory.
Wiig, A. C., Sellberg, C., & Solberg, M. (2023). Reviewing simulator-based training and assessment in maritime education: A topic modelling approach for tracing conceptual developments. WMU Journal of Maritime Affairs. https://doi.org/10.1007/s13437-023-00307-4
Xie, L., Wilson, J., & Sherron, T. (2022). Emotion in teams: A scoping literature review. *European Journal of Training and Development, 47*(7–8), 788–814. https://doi.org/10.1108/EJTD-01-2022-0002
Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). Industry 4.0 and Industry 5.0: Inception, conception, and perception. *Journal of Manufacturing Systems*, 61, 530–535. https://doi.org/10.1016/j.jmsy.2021.10.006

Yang, Y., Antwi-Afari, M. F., Imran, M., & Kong, L. (2024). Effects of transformational leadership and organizational climate on project performance in Industrial Revolution 5.0: A systematic literature review. Journal of Engineering, Design and Technology, 23(5), 1666-1693. https://doi.org/10.1108/JEDT-01-2024-0078

Yin, R. K. (2017). *Case study research and applications: Design and methods* (6th ed.). SAGE.

Yotsov, I. V., Dimitrakiev, D. Y., Zaburtov, A., & Koritarov, T. D. (2017). Analysis of the logistics transport corridors in the Black Sea region based on the short sea shipping concept. In *Proceedings of the 18th Annual General Assembly of the International Association of Maritime Universities (IAMU)* (pp. 502–512).

Yotsov, I. V. (2023). *Ikonomicheskite voĭni: Teoriya i praktika prez XX i XXI vek* [The economic wars: Theory and practice in the 20th and 21st centuries]. Nikola Vaptsarov Naval Academy.

Yukl, G. (2020). *Leadership in Organizations* (9th ed.). Pearson.

Zawacki-Richter, O., Marin, V., Bond, M., & Gouverneur, F. (2023). Systematic review of research on digital teaching and learning in higher education. *International Review of Research in Open and Distributed Learning*, 24(1), 123–147.

Appendix 1

QUESTIONNAIRE

Demographic Section – Respondent Context

Code	Question	Response Options
D1	Gender	☐ Male · ☐ Female · ☐ Prefer not to say
D2	Age group	☐ Up to 25 ☐ 26–35 ☐ 36–45 ☐ 46–55 ☐ Over 55
D3	Nationality	Open-ended
D4	Professional experience in the maritime industry	☐ Under 5 years · ☐ 5–10 years · ☐ 11–20 years · ☐ Over 20 years
D5	Current position / role in the organization	☐ Operational staff · ☐ Management staff · ☐ Academic / training staff · ☐ Administrative staff · ☐ Other (specify)
D6	Type of organization	☐ Maritime company / shipping · ☐ Port authority · ☐ Maritime education / training · ☐ Maritime administration / public sector · ☐ Other (specify)
D7	Experience in multicultural teams	☐ Yes · ☐ No
D8	Level of education	☐ Secondary · ☐ Bachelor · ☐ Master · ☐ Doctor / PhD
D9	Country of current employment	Open-ended
D10	Additional qualifications related to leadership, management, or organizational behavior	Open-ended

1 – "strongly disagree"
2 – "disagree"
3 – "neither agree nor disagree"
4 – "agree"
5 – "strongly agree"

Sector	Question	1	2	3	4	5
H1 – Individual Level: Leadership and Soft Skills						
H1.1	I quickly find my rhythm and balance when conditions in the work environment change	☐	☐	☐	☐	☐
H1.2	I maintain inner calm and clear judgment even in situations of pressure or stress.	☐	☐	☐	☐	☐

Sector	Question	1	2	3	4	5
H1.3	I communicate with ease and respect with people from different cultures and backgrounds.	☐	☐	☐	☐	☐
H1.4	I am able to recognize and understand the feelings and intentions of the people around me.	☐	☐	☐	☐	☐
H1.5	I recognize what I feel and how it influences my behavior.	☐	☐	☐	☐	☐
H1.6	I quickly build understanding and trust in communication with colleagues.	☐	☐	☐	☐	☐
H1.7	I approach problems with logic and creativity to find workable solutions.	☐	☐	☐	☐	☐
H1.8	I find inner motivation and inspire others through my own example.	☐	☐	☐	☐	☐
H1.9	I demonstrate initiative when I see opportunities for improvement or a need for direction.	☐	☐	☐	☐	☐
H1.10	I use digital technologies with confidence and responsibility in my daily work.	☐	☐	☐	☐	☐
H1.11	I have a natural drive to learn, develop, and continuously improve my professional skills.	☐	☐	☐	☐	☐
H1.12	I plan and organize my tasks in a way that allows me to use my time efficiently and effectively.	☐	☐	☐	☐	☐

Sector	Question	1	2	3	4	5
H2 – Team Level: Communication, Trust, and Team Effectiveness						
H2.1	In our team, we communicate openly, clearly, and with mutual respect.	☐	☐	☐	☐	☐
H2.2	My opinion is heard and has significance in the team's decision-making process.	☐	☐	☐	☐	☐
H2.3	In our team, trust, mutual support, and a sense of psychological safety prevail.	☐	☐	☐	☐	☐
H2.4	Conflicts within the team are discussed openly and lead to constructive solutions.	☐	☐	☐	☐	☐
H2.5	I can express differing opinions respectfully, without jeopardizing the positive team spirit.	☐	☐	☐	☐	☐
H2.6	I feel connected to the team and share its goals and responsibilities.	☐	☐	☐	☐	☐
H2.7	Even under pressure or stress, our team manages to maintain effectiveness and coordination.	☐	☐	☐	☐	☐

Sector	Question	1	2	3	4	5
H2.8	The leader of our team fosters an atmosphere of trust, openness, and collaboration.	☐	☐	☐	☐	☐
H2.9	Our team embraces cultural differences as a source of strength and learning.	☐	☐	☐	☐	☐
H2.10	Working in a multicultural environment broadens my perspective and enhances my professional flexibility.	☐	☐	☐	☐	☐

Sector	Question	1	2	3	4	5
H3 – Organizational Level: Learning Culture, Innovation, and Sustainability						
H3.1	In my organization, new ideas are encouraged and conditions for innovation are actively created.	☐	☐	☐	☐	☐
H3.2	When I share ideas for improvement, I feel that they are heard and taken into consideration.	☐	☐	☐	☐	☐
H3.3	The organization I work for actively supports the training and professional development of its employees.	☐	☐	☐	☐	☐
H3.4	In our organization, the exchange of knowledge and best practices is a natural part of the work culture.	☐	☐	☐	☐	☐
H3.5	Leaders within the organization inspire employees to learn and continuously develop.	☐	☐	☐	☐	☐
H3.6	The organization succeeds in combining technological advancement with respect for human needs and values.	☐	☐	☐	☐	☐
H3.7	Decisions within the organization are made with transparency, integrity, and a strong sense of responsibility.	☐	☐	☐	☐	☐
H3.8	Our work environment fosters an atmosphere of trust, collaboration, and readiness for mutual support.	☐	☐	☐	☐	☐
H3.9	I feel that the organizational culture prioritizes people and teams over formal hierarchy.	☐	☐	☐	☐	☐
H3.10	The organization I work for demonstrates readiness and a proactive mindset to adapt to the challenges of Industry 5.0.	☐	☐	☐	☐	☐

Sector	Question	1	2	3	4	5
H4 – Educational and Developmental Level: Leadership, Learning, and Future Competencies						
H4.1	I believe that educational programs in maritime transport build real readiness in future leaders to address the challenges of the profession.	☐	☐	☐	☐	☐
H4.2	Education in maritime transport develops leadership, social, and emotional competencies in students.	☐	☐	☐	☐	☐
H4.3	Curricula include courses that develop skills in teamwork, organizational behavior, and human interaction.	☐	☐	☐	☐	☐
H4.4	The educational process emphasizes effective communication, professional ethics, and responsibility.	☐	☐	☐	☐	☐
H4.5	The academic environment stimulates critical thinking, independence, and responsible decision-making.	☐	☐	☐	☐	☐
H4.6	There is a tangible link between educational programs and the real needs of the maritime industry.	☐	☐	☐	☐	☐
H4.7	Academic institutions maintain active cooperation with representatives of the maritime business and industry.	☐	☐	☐	☐	☐
H4.8	Lecturers inspire students to develop leadership thinking, teamwork skills, and confidence in their own abilities.	☐	☐	☐	☐	☐
H4.9	I believe that education should be more practice-oriented and include real cases from maritime practice.	☐	☐	☐	☐	☐
H4.10	I believe that the development of soft skills should be a leading priority in educational programs.	☐	☐	☐	☐	☐

Appendix 2

EXECUTIVE EDUCATION PROGRAM

"Soft Skills for Maritime Leaders in the Era of Industry 5.0"

Executive Education Programme for the Water Transport Sector, Developed in the Spirit of Industry 5.0

This programme has been developed as part of the scholarly contribution of the monograph "The Human Factor in the Era of Industry 5.0", with the aim of providing a practical application of the concept of human-centred learning in the era of Industry 5.0.

1. Training Design and Development Roadmap

The programme supports the development of maritime and logistics professionals who combine technical competence with cultural awareness, emotional intelligence, and human-centred leadership. It promotes effective management of cultural diversity, ethical and empathetic communication, and a shift from control-oriented management to collaborative, values-based leadership, positioning diversity as a strategic resource for sustainable organisational performance in the maritime sector.

2. Format and Duration

- Type: Executive Education Training Programme
- Duration: 3 days / 24 academic hours
- Format: Interactive, experiential, and transformational learning
- Method**:** Integrated learning combining theory, simulations, role-playing scenarios, group discussions and coaching sessions

3. Programme Objectives

- Develop leadership and interpersonal skills adapted to the specific operational and organisational dynamics of the maritime industry;
- Enhance emotional intelligence, self-regulation, and stress management in high-responsibility and high-risk environments;
- Strengthen collective effectiveness, trust, and shared responsibility within multicultural and interdisciplinary teams;
- Support adaptive decision-making and leadership effectiveness under conditions of uncertainty and operational complexity, in line with the human-centred principles of Industry 5.0.

4. Target Group

The programme is designed for executives, ship officers, managers, lecturers, trainers, and professionals involved in leadership, team management, and human resource development within the maritime industry.

Key participant profiles include:

- **Maritime Shipping:** Captains, deck and engine officers, second officers, maritime cargo operations specialists, safety officers, and maritime freight forwarders.
- **Logistics and Port Operations:** Logistics managers and coordinators, port operations managers, supply chain and port service planners, administrative coordinators, and communication and public relations specialists.
- **Cruise Industry and Maritime Management:** Human resources managers, hotel managers, entertainment managers, food and beverage (F&B) managers, housekeeping supervisors, cruise administration assistants, and lecturers and instructors in maritime management.

5. Methodology and Learning Logic

The educational approach is experiential, interactive, and transformational, grounded in learning through action, reflection, and awareness. The programme follows a structured three-day developmental model that builds progressive levels of leadership awareness and human-centred competence.

- **Day 1: Knowing the Other → Understanding Difference → Knowledge and Context**

The focus is on developing awareness of human differences, emotions, and behaviour, providing participants with the conceptual and contextual foundations for effective interpersonal and intercultural engagement.

- **Day 2: Interacting with the Other → Managing Bias → Experience and Awareness**

Emphasis is placed on mastering verbal, non-verbal, and written communication, addressing implicit bias, and developing conscious, ethical influence through experiential practice and reflection.

- **Day 3: Leading and Inspiring through Difference → Leadership Transformation and Practical Application**

Learning is translated into leadership practice through trust-building, motivation through meaning and shared values, and the application of human-centred leadership strategies in complex maritime environments.

The methodology integrates experiential learning, coaching and facilitation, real maritime case studies, video analysis, and group simulations. The programme fulfils a dual mission: professionally, it enhances leadership, communication, and emotional competencies that support effectiveness, safety, and cohesion in dynamic maritime and logistics contexts; humanely, it cultivates empathy, respect, and responsible influence. Overall, the programme promotes a human-centred management culture in which technological advancement is complemented by a deep understanding of human motivation, emotions, and interpersonal relationships.

6. Core Methods

Method	Description and Educational Function
Interactive Lecture	Presentation of key theoretical concepts through dialogue, illustrative examples and short practical exercises. The instructor acts as a facilitator rather than a traditional lecturer, encouraging discussion and the exchange of professional experience among participants.
Simulations and Scenario-Based Training	Implementation of realistic situations drawn from maritime practice, such as on-board crises, intercultural conflicts or leadership challenges. Participants assume roles and make decisions under pressure. This method develops adaptability, emotional regulation and intercultural awareness.
Video Analysis and Observation	Use of short video materials and real-life cases from maritime and logistics practice. Behaviour, non-verbal cues and communication errors are analysed to raise awareness of implicit patterns and to build constructive communication strategies.
Group Work and Facilitated Discussions	Small groups work on specific tasks, discuss solutions and present outcomes. The facilitator guides the process through targeted questions and feedback. This method fosters collaboration, team ethics and respect for diverse perspectives.
Role Play	Practical simulations in which participants assume specific roles (e.g. captain, manager, officer, logistics specialist) and respond to predefined scenarios. The objective is to experience real-life situations and acquire effective behavioural models.
Implicit Attitudes Assessment (Implicit Association Test – IAT)	An online or paper-based instrument enabling participants to identify subconscious biases related to nationality, age, gender or culture. This is followed by a facilitated discussion and the development of an action plan for conscious behaviour. The method supports self-awareness and reduces the risk of discriminatory practices.
Coaching and Group Facilitation	Individual and team-based coaching elements aimed at developing awareness, personal responsibility and leadership flexibility. The facilitator creates a reflective space for self-analysis and supports participants in identifying their own solutions.
Case Studies	Analysis of real-life examples from the maritime, logistics and cruise industries. Case studies support the integration of theory and practice, encourage strategic thinking and promote organisational learning.
Team Simulations	Complex group exercises in which participants solve shared tasks under time pressure and cultural diversity constraints. This method develops collaboration, leadership, mutual trust and decision-making skills in multicultural environments.
Reflective Session and Awareness Journal	At the end of each day, a reflective session is conducted in which participants articulate personal insights and learning outcomes. A “coaching journal” is used as an individual tool for self-assessment and progress tracking.

7. Methodology Summary

The training methodology is grounded in experiential and reflective learning, where knowledge is generated primarily through structured experience and guided reflection rather than through lecture-based instruction alone. Emphasis on *learning by doing* and *learning by reflection* enables the integration of cognitive, emotional, and social dimensions of competence.

From an academic perspective, the applied methodology operationalises the human-centred leadership framework presented in the monograph by translating key constructs—such as emotional intelligence, ethical influence, communication effectiveness, and collective responsibility—into observable behaviours and leadership practices. Consequently, the programme functions not only as a training intervention, but also as a methodological validation of a human-centred approach to leadership and organisational behaviour in the context of Industry 5.0.

8. Expected Learning Outcomes

Upon completion of the programme, participants will be able to demonstrate the following competences, knowledge, understanding and proficiency, assessed in accordance with the competence-based assessment framework and outcome-oriented standards of the STCW Code.

Competence	**Knowledge, Understanding and Proficiency**	**Methods for Demonstrating Competence**	**Criteria for Evaluating Competence**
Effective interpersonal communication in multicultural maritime environments	Knowledge of communication models, cultural differences, emotional dynamics and non-verbal signals. Understanding the impact of language, tone and behaviour in high-risk and high-responsibility maritime contexts. Proficiency in empathetic, assertive and context-sensitive communication.	Role plays; simulations; analysis of real maritime cases; video observation; group discussions; final integrated simulation.	Communication is clear, respectful and situationally appropriate. Messages are adapted to cultural and professional context. Active listening is demonstrated. Misunderstandings are identified and addressed constructively.
Emotional self-regulation and stress management under operational pressure	Knowledge of emotional processes, stress responses and coping mechanisms in maritime environments. Understanding the link between emotions, behaviour and decision-making. Proficiency in applying self-regulation techniques in practice.	Scenario-based simulations; reflective journals; coaching sessions; observation during group exercises.	Emotional reactions are recognised and managed effectively. Behaviour remains controlled under pressure. Stress responses do not negatively affect communication, safety or team dynamics.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Ethical and intentional influence through communication	Knowledge of ethical influence, persuasion techniques and leadership communication principles. Understanding the boundary between influence, manipulation and authority. Proficiency in using language and behaviour to motivate and guide others ethically.	Role plays; simulations; case studies; peer feedback; facilitator observation.	Influence is exercised transparently and ethically. Language promotes trust and motivation. No coercive, manipulative or discriminatory behaviour is observed.
Building trust and psychological safety in teams	Knowledge of trust-building mechanisms, psychological safety and team dynamics. Understanding the role of leader behaviour in creating inclusive and supportive environments. Proficiency in fostering open communication and mutual respect.	Team simulations; group tasks; reflective discussions; final group simulation.	Team members feel safe to express ideas and concerns. The participant encourages participation, respect and collaboration. Conflicts are handled constructively.
Leadership based on human-centred values and intrinsic motivation	Knowledge of human-centred leadership principles, motivation theories and Industry 5.0 values. Understanding how meaning, recognition and shared values drive performance. Proficiency in motivating individuals and teams beyond formal authority.	Leadership simulations; coaching exercises; case studies; individual development plan.	Leadership behaviour demonstrates empathy, responsibility and value-based decision-making. Motivation strategies align organisational goals with individual well-being.
Constructive conflict management and tension de-escalation	Knowledge of conflict types, escalation patterns and resolution strategies. Understanding emotional and cultural factors in conflict situations. Proficiency in transforming conflict into learning and cooperation.	Role-play simulations; crisis scenarios; facilitated debriefing; observation.	Conflicts are addressed calmly and respectfully. De-escalation techniques are applied effectively. Outcomes support cooperation and team cohesion.
Reflective self-awareness and continuous personal development	Knowledge of reflective practice and self-assessment tools. Understanding personal strengths, limitations and behavioural patterns. Proficiency in setting realistic development goals.	Reflective journal; individual development plan; coaching discussions.	Participant demonstrates honest self-assessment, clear learning insights and realistic,actionable development objectives.

9. Structure of the Three-Day Training Programme

Overall Training Framework

Day	Module / Core Focus	Learning Objectives	Key Methods
Day 1	**Module 1: Understanding People – Human Behaviour, Emotions and Motivation**	Raising awareness of individual differences, temperament, personality profiles and motivational mechanisms. Developing sensitivity to human behaviour and emotional dynamics.	Interactive lecture; personality profiling (DISC, MBTI); group exercise "What Drives People"; video analysis; facilitated debriefing.
Day 2	**Module 2: Communicating and Influencing – Communication Nuances and Written Communication**	Developing empathetic and assertive communication skills; applying intentional and ethical influence through language, tone and behaviour; mastering written and virtual team communication.	Simulations; role plays "The Power of Words"; analysis of emails and chat messages; online communication training; facilitated discussion on ethics and influence.
Day 3	**Module 3: Leading and Motivating – Leadership Techniques and Pathways to Productivity**	Building human-centred leadership: motivating through meaning and trust; leveraging individual strengths to achieve organisational goals and personal fulfilment.	Coaching simulations; facilitation; maritime case studies; exercise "Leader of Inspiration"; final simulation "Navigator of Human Potential".

10. Training Schedule

Day 1 – Module 1: HUMAN Behaviour, Emotions and Motivation

Time	Session Topic	Content and Objectives	Training Methods
08:00 – 08:30	Opening and Introduction	Presentation of the programme structure and objectives. Raising awareness of the role of the human factor in the context of Industry 5.0.	Interactive lecture; group discussion
08:30 – 09:30	Personality Types and Thinking Styles (DISC, MBTI)	Identification of personality types and differences in approaches to tasks and decision-making.	Self-assessment; personality profiling tools; facilitated debriefing
09:30 – 10:30	Emotions, Behaviour and Stress in the Maritime Environment	Understanding emotional responses under pressure, isolation and operational stress.	Video analysis; practice-based case studies
10:30 – 10:45	Coffee Break	—	—
10:45 – 12:15	Intrinsic Motivation and Human Needs	Distinguishing between intrinsic and extrinsic motivation; awareness of personal "energy sources" and drivers.	Role play "What Motivates Me"; facilitated debriefing
12:15 – 13:00	Lunch Break	—	—

13:00 – 14:30	Behavioural Styles within Teams	Identifying individual differences and their impact on team dynamics and collaboration.	Group work; simulation "A Team of Diverse Personalities"
14:30 – 15:15	Understanding Hidden Emotional Signals	Recognising non-verbal indicators, tone of voice and implicit emotional cues.	Video analysis; exercises "Reading Between the Lines"
15:15 – 16:00	Reflection: How I Influence the People Around Me	Daily synthesis and self-analysis of personal interaction and communication style.	Individual reflective journal; facilitated group reflection
Total for the day:	8 academic hours (6 astronomical hours)		

Day 2 – Module 2: Communicating and Influencing

Time	Session Topic	Content and Objectives	Training Methods
08:00 – 08:45	The Power of Words and the Language of Influence	Understanding the emotional impact of language and the role of positive framing in communication.	Interactive lecture; language awareness exercises
08:45 – 09:45	Empathetic and Assertive Communication	Achieving balance between expressing one's viewpoint and showing respect for others.	Role plays; facilitated debates
09:45 – 10:30	Intentional Influence through Communication	Ethical use of words, tone of voice and behaviour to guide, persuade and motivate.	Simulations; analysis of real-life cases
10:30 – 10:45	Coffee Break	—	—
10:45 – 12:00	Written Team Communication (Email Etiquette and Chat Culture)	Developing a professional written communication style and preventing misunderstandings.	Email analysis; group simulations; video analysis
12:00 – 12:45	Lunch Break	—	—
12:45 – 14:15	Virtual Communication and Remote Team Leadership	Developing skills for leading remote teams and maintaining trust in virtual environments.	Online simulations; coaching exercises
14:15 – 15:15	The Language of Trust: How We Communicate to Be Trusted	Practising authentic communication and active empathy.	Role plays; video-based feedback
15:15 – 16:00	Reflection: The Impact I Leave Behind	Raising awareness of personal communication style and influence.	Individual reflective journal; facilitated debriefing
Total for the day:	8 academic hours (6 astronomical hours)		

Day 3 – Module 3: Leadership Techniques and Pathways to Productivity

Time	Session Topic	Content and Objectives	Training Methods
08:00 – 08:45	Human-Centred Leadership and Trust	Understanding the evolving role of the leader as a facilitator and source of inspiration.	Interactive lecture; group discussion
08:45 – 09:45	Motivation and Engagement	Understanding the factors that sustain intrinsic motivation, commitment and loyalty.	Exercise "Map of Meaning"; facilitation
09:45 – 10:30	Pathways to Team Productivity	Aligning organisational objectives with employee satisfaction and well-being.	Case studies; coaching exercises
10:30 – 10:45	☕ Coffee Break	—	—
10:45 – 12:15	Leveraging Individual Strengths	Identifying and applying individual talents and strengths for the benefit of the team.	Profile analysis; group coaching
12:15 – 13:00	🕛 Lunch Break	—	—
13:00 – 14:15	Conflict and Stress Management through Trust and Support	Transforming tension and conflict into constructive energy and learning opportunities.	Role-play simulations "Crisis as Opportunity"
14:15 – 16:00	Final Simulation: "Navigator of Human Potential"	Integration of all soft skills – communication, influence, motivation and leadership.	Complex group simulation; facilitated debriefing
Total for the day:	8 academic hours (6 astronomical hours)		

11. Certification and Assessment

- **Assessment:** active participation (50%) and an individual development plan entitled "My Development as a Human-Centred Leader" (50%).
- **Final session:** a comprehensive simulation "Navigator of Human Potential", assessing participants' communication, influence and motivation skills.
- **Certification document:** Certificate of Successful Completion of the programme "Soft Skills for Maritime Leaders in the Era of Industry 5.0".

The certificate may be recognised as part of **Continuing Professional Development (CPD)** programmes within the maritime and logistics sectors.

12. Analysis and Academic Contributions of the Programme

Scientific and Conceptual Contribution

The programme "Soft Skills for Maritime Leaders in the Era of Industry 5.0" represents an applied operationalisation of the human-centred leadership framework developed in the monograph "The Human Factor in the Era of Industry 5.0". It integrates psychological, communicative, and leadership perspectives into a coherent training model, addressing

a critical gap in traditional maritime education related to emotional intelligence, ethical influence, and strategic communication.

Methodological Contribution

The programme introduces a structured experiential learning model for the development of soft skills in maritime leadership, combining simulations, coaching, reflective practice, and real-life case analysis. The methodology enables participants to progress through successive levels of leadership awareness—knowing, interacting, and leading—effectively bridging theoretical constructs with observable leadership behaviours and professional practice.

Applied and Organizational Contribution

The applied implementation of the programme supports enhanced communication effectiveness, emotional self-regulation, trust-building, and team cohesion in multicultural and high-pressure maritime environments. By fostering psychological safety and ethical influence, the programme contributes to improved organisational effectiveness, safety, and sustainable team performance.

Educational and Strategic Relevance

The programme serves as an applicable Executive Education model for higher maritime education and professional development initiatives, aligned with the principles of Industry 5.0. It supports human capital development by positioning productivity and human well-being as mutually reinforcing dimensions of sustainable leadership within the maritime sector.

Appendix 3

EXECUTIVE EDUCATION PROGRAMME

"INTERCULTURAL LEADERSHIP AND TEAM MANAGEMENT IN WATER TRANSPORT IN THE CONTEXT OF INDUSTRY 5.0"

Executive Education Programme For The Water Transport Sector, Developed In The Spirit Of Industry 5.0

This programme has been developed as part of the scholarly contribution of the monograph "The Human Factor in the Era of Industry 5.0", with the aim of providing a practical application of the concept of human-centred learning in the era of Industry 5.0.

1. Training Design and Development Roadmap

The course aims to develop a new generation of maritime and logistics professionals who combine technical and organisational competence with cultural awareness, emotional intelligence, and human-centred leadership in line with Industry 5.0. It focuses on understanding, respecting, and effectively managing cultural and religious diversity in international maritime, logistics, and cruise industry teams, while addressing hidden intercultural barriers and strengthening trust-based, ethical, and empathetic communication. By integrating theory, practice, and reflection through experiential learning, the programme supports a shift from control-oriented management to collaborative and conscious leadership, bridging academic knowledge with real-world maritime practice and positioning diversity as a strategic resource for human-centred organisational success.

2. Format and Duration

- Type: Executive Education Training Programme
- Duration: 3 days / 24 academic hours
- Format: Interactive, experiential, and transformational learning
- Method**:** A combination of theory, simulations, role-playing, and facilitation

3. Programme Objectives

- To develop intercultural awareness and the ability to interact effectively within multicultural teams;
- To enhance participants' emotional and cultural intelligence (EQ and CQ);
- To build competencies in empathetic leadership and the management of biases and prejudices;
- To support a human-centred approach to the management of people and processes;

- To stimulate organisational learning based on respect and collective intelligence.

4. Target Group

The course is designed for senior executives, ship officers, managers, lecturers, and professionals working in the maritime transport, logistics, port operations, and cruise industry who operate in multicultural environments and seek to enhance their competencies in intercultural communication, adaptability, and human-centred leadership.

Key participant profiles include:

- **Maritime Transport:** Captains, deck and engine officers, second officers, maritime cargo operations specialists, safety officers, and maritime freight forwarders.
- **Logistics and Port Operations:** Logistics managers and coordinators, port operations managers, supply and port service planners, administrative coordinators, and communication and public relations specialists.
- **Cruise Industry and Maritime Management:** Human resources managers, hotel and hospitality managers, entertainment managers, food and beverage managers, housekeeping supervisors, cruise administration assistants, and lecturers in maritime management.

5. Methodology and Learning LOGIC

The educational approach is experiential, interactive, and transformational, grounded in learning through action, reflection, and awareness. The programme follows a structured three-day developmental pathway that builds intercultural competence and human-centred leadership.

- **Day 1: Knowing the Other → Understanding Difference → Knowledge and Context**

The focus is on building foundational understanding of cultural and religious diversity, providing participants with the conceptual frameworks and contextual knowledge necessary for effective intercultural engagement.

- **Day 2: Interacting with the Other → Managing Biases → Experience and Awareness**

Participants engage in experiential learning that explores team dynamics, trust, first impressions, and implicit biases, fostering awareness and conscious interaction in multicultural environments.

- **Day 3: Leading and Inspiring through Difference → Leadership Transformation and Practical Application**

Learning is translated into practice through the development of intercultural leadership skills, empathy, adaptive behaviour, and practical strategies for sustainable collaboration.

The course pursues a dual mission: professionally, it enhances effectiveness and safety in international maritime operations through improved management of human

interactions; humanely, it supports a values-based shift in perspective, enabling participants to see diversity as a source of growth, innovation, and collective strength.

Delivered through a combination of interactive, experiential, and coaching-based methods, the programme ensures active engagement, critical thinking, and effective knowledge transfer to real maritime practice. Rooted in the human-centred educational model of Industry 5.0, it places personal experience and awareness at the core of leadership development.

6. Core Methods

Method	Description and Educational Function
Interactive Lecture	Presentation of key theoretical concepts through dialogue, real-life examples, and short exercises. The lecturer acts as a facilitator rather than a traditional instructor, encouraging discussion and experience-sharing among participants.
Simulations and Scenario-Based Training	Implementation of realistic maritime situations such as onboard crises, conflicts between different nationalities, or leadership challenges. Participants assume roles and make decisions under pressure, developing adaptability, emotional regulation, and intercultural awareness.
Video Analysis and Observation	Use of short video materials and real case examples from maritime and logistics practice, followed by analysis of behaviour, non-verbal cues, and communication breakdowns. The method supports awareness of implicit patterns and the development of constructive communication strategies.
Group Work and Facilitated Discussions	Small groups work on specific tasks, discuss solutions, and present outcomes. The facilitator guides the process through targeted questions and feedback, fostering collaboration, team ethics, and respect for diverse perspectives.
Role Play	Practical simulations in which participants assume specific roles (e.g. captain, manager, officer, logistics specialist) and respond to a given scenario. The goal is experiential learning and the acquisition of effective behavioural models.
Implicit Association Test (IAT)	An online or paper-based tool enabling participants to identify unconscious biases related to nationality, age, gender, or culture. This is followed by facilitated discussion and conscious behaviour planning, supporting self-awareness and reducing discrimination risks.
Coaching and Group Facilitation	Individual and team coaching elements focused on developing awareness, personal responsibility, and leadership flexibility. The facilitator creates a reflective space that supports self-analysis and participant-driven solutions.
Case Studies	Analysis of real cases from the maritime, logistics, and cruise industries. Case-based learning supports the integration of theory and practice, encourages strategic thinking, and strengthens organisational learning.
Team Simulations	Complex group exercises in which participants solve shared tasks under time pressure and cultural diversity constraints. This method develops collaboration, leadership, mutual trust, and decision-making skills in multicultural environments.
Reflective Sessions and Awareness Journal	Daily reflective sessions where participants articulate personal insights and learning outcomes. A “coaching journal” is used as an individual self-assessment tool to track progress and deepen reflective practice.

7. Methodology Summary

The training methodology is grounded in experiential and reflective learning, where knowledge emerges primarily from structured experience and guided reflection rather than from lecture-based instruction alone. Emphasis on *learning by doing* and *learning by reflection* enables the integration of cognitive, emotional, and social dimensions of competence.

From an academic perspective, the applied methodology operationalises the human-centred leadership framework developed in the monograph by translating theoretical constructs—such as emotional intelligence, cultural intelligence, and collective learning—into observable behaviours and professional practices. In this sense, the programme functions not only as a training intervention, but as a methodological validation of the proposed model for organisational behaviour and leadership in the context of Industry 5.0.

8. Expected Learning Outcomes

Upon completion of the programme, participants will be able to demonstrate the competences, knowledge, understanding and proficiency outlined below, assessed in accordance with the competence-based training and outcome-oriented assessment principles of the STCW Code, using defined methods for demonstrating competence and criteria for evaluating competence.

Competence	**Knowledge, Understanding and Proficiency**	**Methods for Demonstrating Competence**	**Criteria for Evaluating Competence**
Intercultural awareness and understanding of cultural and religious diversity in maritime environments	Knowledge of cultural models (Hofstede, Trompenaars, CQ), religious practices and their impact on behaviour at work. Understanding how cultural values influence communication, ethics and teamwork. Proficiency in recognising and interpreting cultural differences.	Case studies; simulations; video analysis; group discussions; Implicit Association Test (IAT).	Cultural differences are accurately identified and interpreted. Participant demonstrates respect and awareness of cultural and religious sensitivities in professional contexts.
Effective intercultural communication in multicultural teams	Knowledge of verbal, non-verbal and contextual communication across cultures. Understanding barriers caused by stereotypes, assumptions and first impressions. Proficiency in adapting communication style to multicultural contexts.	Role plays; scenario-based training; video feedback; observation during team exercises.	Communication is clear, inclusive and culturally appropriate. Misunderstandings are minimised or constructively resolved. Trust-building language and behaviour are demonstrated.
Recognition and management of implicit biases and stereotypes	Knowledge of cognitive biases, stereotypes and their influence on judgement and decision-making. Understanding personal bias patterns. Proficiency in applying conscious behaviour and ethical judgement.	Implicit Association Test (IAT); facilitated reflection; coaching sessions; group debriefings.	Participant demonstrates awareness of own biases and applies strategies to mitigate their impact on behaviour and leadership decisions.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Building trust and ethical relationships in culturally diverse teams	Knowledge of trust-building mechanisms, interpersonal ethics and psychological safety. Understanding the leader's role in shaping inclusive team climates. Proficiency in fostering respect and collaboration.	Team simulations; group tasks; reflective discussions; leadership exercises.	Trust-based interactions are evident. Participant encourages participation, fairness and respect. Ethical dilemmas are handled responsibly.
Intercultural leadership based on empathy and human-centred values	Knowledge of human-centred leadership principles, EQ and CQ frameworks. Understanding how empathy and adaptability enhance leadership effectiveness. Proficiency in applying inclusive leadership behaviours.	Leadership simulations; coaching exercises; case studies; final certification simulation.	Leadership behaviour reflects empathy, adaptability and ethical responsibility. Decisions support team cohesion and sustainable performance.
Constructive management of intercultural conflict and tension	Knowledge of conflict dynamics in multicultural settings. Understanding emotional, cultural and value-based triggers. Proficiency in de-escalation and constructive resolution techniques.	Conflict simulations; role plays; facilitated debriefing; observation.	Conflicts are addressed calmly and respectfully. De-escalation techniques are applied effectively. Outcomes support cooperation and learning.
Reflective self-awareness and continuous intercultural development	Knowledge of reflective practice and personal development planning. Understanding individual strengths and limitations in intercultural contexts. Proficiency in setting development goals.	Reflective journal; individual action plan; coaching discussions.	Participant demonstrates critical self-reflection and formulates realistic, applicable intercultural development objectives.

9. Structure of the Three-Day Training Programme

Overall Training Framework

Day	Module / Main Focus	Learning Objectives	Key Methods
Day 1	**Module 1: Intercultural Foundations – Cultures, Religions, and Human Behaviour in Maritime Transport**	To build knowledge of cultural and religious differences influencing communication, ethics, and team management; to raise awareness of personal attitudes and implicit biases.	Interactive lectures, video analysis, group discussions, simulations, facilitated reflection, Implicit Association Test (IAT).

Day 2	**Module 2: Team Dynamics, Trust, and First Impressions in Multicultural Environments**	To develop skills for effective communication, trust-building, and conflict resolution in culturally diverse teams.	Role play, scenario-based training, facilitation, First Impression training, group debriefing.
Day 3	**Module 3: Intercultural Leadership and Team Management in the Spirit of Industry 5.0**	To develop leadership competencies based on empathy, cultural intelligence, and coaching approaches; to apply human-centred management to real situations through simulations and leadership exercises.	Coaching, facilitation, simulations, EQ and CQ analysis, group exercises, certification simulation "The Captain of the Cultural Bridge".

10. Training Schedule

Day 1 – Module 1: Intercultural Foundations – Cultures, Religions, and Human Behaviour in Maritime Transport

Time	Session Topic	Methods / Educational Approach
08:00 – 08:45	Introduction: The Role of Cultural Intelligence in the Era of Industry 5.0	Interactive lecture with visual materials and facilitated discussion on participants' expectations
08:45 – 10:00	Models of Cultural Differences – Hofstede, Trompenaars, Cultural Intelligence (CQ)	Model analysis, mini-quiz, video analysis of real-life situations, group interpretation
10:00 – 10:15	☕ Coffee Break	—
10:15 – 11:45	Cultural Paradigms: Western, Asian, Arab, Latin American, Eastern European	Group work exploring cultural scenarios, role-based mini simulations
11:45 – 12:30	Major Religions in International Crews and Their Impact on Work Behaviour	Presentation, video analysis, facilitated discussion on ethical dilemmas
12:30 – 13:30	🍴 Lunch Break	—
13:30 – 15:00	Simulation "Cultural Kaleidoscope" – Working in Mixed Teams	Scenario-based training, observation of team dynamics, facilitation

Time	Session Topic	Methods / Educational Approach
15:00 – 15:15	☕ Coffee Break	—
15:15 – 16:00	Group Reflection: Personal Cultural Profile and Awareness of Biases	Reflective session, coaching journal, Implicit Association Test (IAT)
Total for the day:	8 academic hours (6 astronomical hours and 15 minutes)	

Day 2 – Module 2: Team Dynamics, Trust, and First Impressions in a Multicultural Environment

Time	Session Topic	Methods / Educational Approach
08:00 – 08:45	Impact of Attitudes and Biases in the International Work Environment	Analysis of real-life cases, group brainstorming, facilitated discussion
08:45 – 10:15	First Impression Training – Non-verbal Communication, Voice, Distance, Eye Contact	Role play, video feedback, pair-based exercises
10:15 – 10:30	☕ Coffee Break	—
10:30 – 11:45	Unconscious Stereotypes and Cognitive Biases (Implicit Bias Training)	Implicit Association Test (IAT), group discussion of results, facilitation
11:45 – 12:30	Building Trust and Interpersonal Ethics in Cultural Diversity	Negotiation simulation, discussion of moral dilemmas
12:30 – 13:30	🍴 Lunch Break	—
13:30 – 15:00	Simulation "Mission in the Storm" – Teamwork under Cultural Tension	Scenario-based training, observation, facilitated debriefing
15:00 – 15:15	☕ Coffee Break	—
15:15 – 16:00	Group Debriefing: Behaviour Analysis and Lessons for Real Practice	Coaching-based discussion, reflective journal work

Time	Session Topic	Methods / Educational Approach
Total for the day:	8 academic hours (6 astronomical hours and 15 minutes)	

Day 3 – Module 3: Intercultural Leadership and Team Management in the Spirit of Industry 5.0

Time	Session Topic	Methods / Educational Approach
08:00 – 08:45	Principles of Human-Centred Leadership – Trust, Meaning, and Ethics	Interactive lecture, facilitated discussion with practical examples
08:45 – 10:15	Leadership Techniques in Multicultural Environments – Influence, Facilitation, Active Empathy	Mini-training, communication scenario exercises, role exchange
10:15 – 10:30	☕ Coffee Break	—
10:30 – 11:45	Leader Under Pressure Training – Intercultural Conflict Simulation	Simulation, facilitation, analysis of leadership behaviour
11:45 – 12:30	Emotional and Cultural Intelligence (EQ + CQ) as the Foundation of Adaptive Leadership	EQ/CQ assessments, self-evaluation, group debriefing
12:30 – 13:30	🍴 Lunch Break	—
13:30 – 15:00	Coaching and Facilitating Intercultural Teams – Motivating and Inspiring Diverse Individuals	Group coaching, facilitation, analysis of real-life cases
15:00 – 15:15	☕ Coffee Break	—
15:15 – 16:00	Final Simulation "The Captain of the Cultural Bridge" – Certification Exercise for Synthesis and Leadership	Complex simulation, peer assessment, facilitated feedback, symbolic certification
Total for the day:	8 academic hours (6 astronomical hours and 15 minutes)	

11. Certification and Assessment

- **Assessment format:** Active participation in exercises, case studies, and simulations (60%), and an individual action plan for professional and organisational application (40%).
- **Final assessment:** Simulation "The Captain of the Cultural Bridge" – a leadership exercise synthesising competencies developed across all three training days.
- **Certification:** Certificate of Successful Completion of the programme "Intercultural Leadership and Team Management in Waterborne Transport in the Context of Industry 5.0" (Executive Education).

The certificate may be recognised as part of **Continuing Professional Development (CPD)** programmes in the maritime and logistics sectors.

12. Analysis and Academic Contributions of the Programme

Scientific and Conceptual Contribution

The programme represents an applied operationalization of the theoretical framework developed in the monograph "The Human Factor in the Era of Industry 5.0". It translates the integrated human factor model into a structured training design, demonstrating the practical applicability of human-centred leadership principles within the context of Industry 5.0.

Methodological Contribution

The programme introduces a structured experiential learning model for developing intercultural competence in maritime environments, combining simulations, reflective practice, and leadership coaching. This methodology provides a replicable framework applicable to both higher education and corporate maritime training.

Applied and Organisational Contribution

Empirical implementation results indicate enhanced intercultural awareness, reduced communication-related conflicts, and improved organisational cohesion and safety in multicultural teams. The programme positions diversity as a strategic organisational resource rather than an operational risk.

Educational and Strategic Relevance

The programme serves as a pilot Executive Education model for Southeast Europe, supporting lifelong learning and continuous professional development (CPD) in the maritime and logistics sectors, aligned with the human-centred paradigm of Industry 5.0.

Appendix 4

EXECUTIVE EDUCATION PROGRAMME

"Managing Organizational Culture and Change in the Era of Industry 5.0"

Executive Education Programme For The Water Transport Sector, Developed In The Spirit Of Industry 5.0

This programme has been developed as part of the scholarly contribution of the monograph "Organisational Behaviour and Leadership in Water Transport", with the aim of providing a practical application of the concept of human-centred learning in the era of Industry 5.0.

1. Training Design and Development Roadmap

The Executive Education programme "Organisational Culture and Change Management in the Maritime Sector in the Era of Industry 5.0" is developed in line with the human-centred principles of Industry 5.0 and forms an applied component of the Integrated Human Factor Development Model in the Maritime Industry, presented in the monograph "Organisational Behaviour and Leadership in Maritime Transport." It operationalises empirically validated links between organisational culture, leadership behaviour, communication practices, and organisational effectiveness within a practical training framework.

The programme is designed to develop conscious understanding among maritime leaders and managers of organisational culture as a living system that shapes behaviour, values, and human interaction. It builds competence in managing culture and change in technologically advanced yet human-centred maritime environments, supporting effectiveness, safety, and sustainability.

In the spirit of Industry 5.0, the programme approaches technology as an enabler of human culture rather than a threat. Digital tools such as virtual reality, interactive simulations, collaborative platforms, gamified learning, and artificial intelligence are positioned as facilitators of transparency, collaboration, learning, and shared meaning. In this way, the training supports human-centred change, understood not as a top-down directive but as a shared journey towards a common vision and organisational maturity.

2. Format and Duration

- Type: Executive Education Training Programme
- Duration: 2 days / 16 academic hours
- Format: Interactive, experiential, and transformational learning
- Method: Integrated approach combining theory, practice, role-based simulations, and facilitation

3. Programme Objectives

- Develop competencies for identifying, analysing, and interpreting organisational cultures within maritime and logistics contexts;

- Build skills for managing cultural change through empathy, engagement, and inclusive leadership rather than coercion;
- Integrate technological innovation with human values in line with the principles of Industry 5.0;
- Foster a culture of learning, trust, and mutual respect in maritime and logistics organisations;
- Position leaders as facilitators of cultural transformation and collective meaning-making.

4. Target Group

The programme is designed for executives, ship officers, managers, lecturers, trainers, and professionals involved in leadership, team management, and human resource development within the maritime industry.

Key participant profiles include:

- **Maritime Shipping:** Captains, deck and engine officers, second officers, maritime cargo operations specialists, safety officers, and maritime freight forwarders.
- **Logistics and Port Operations:** Logistics managers and coordinators, port operations managers, supply chain and port service planners, administrative coordinators, and communication and public relations specialists.
- **Cruise Industry and Maritime Management:** Human resources managers, hotel managers, entertainment managers, food and beverage (F&B) managers, housekeeping supervisors, cruise administration assistants, and lecturers and instructors in maritime management.

5. Methodology and Learning LOGIC

The educational approach is experiential, interactive, and transformational, grounded in learning through action, reflection, and awareness. Participants are positioned at the centre of the learning process—not as passive recipients of information, but as active co-creators of organisational reality.

The programme follows a two-stage developmental model reflecting the dynamics of cultural awareness and transformation:

- **Day 1: Becoming Aware of Culture → Understanding Values, Norms, and Behaviour**

The focus is on recognising and analysing organisational culture as a living system. Participants explore values, norms, behaviours, and unspoken rules that shape team environments, collective behaviour, and safety, while identifying hidden cultural mechanisms influencing organisational dynamics.

- **Day 2: Leading Change → Managing Cultural Transformation through Leadership and Technology**

Learning is translated into practice through leadership approaches to communication, support, and change management. Participants develop the ability to use both human and

technological tools to foster sustainable cultures of learning, trust, engagement, and adaptability.

The methodology integrates experiential learning, coaching and facilitation, analysis of real maritime and logistics case studies, video analysis, and group simulations. Learning activities include role-based simulations drawn from maritime practice, facilitated discussions and video analysis to examine organisational dynamics and leadership messaging, interactive exercises and mini-workshops to generate collective solutions, and reflective practice supported by individual learning journals.

Digital tools and platforms - such as virtual reality (VR), interactive polling applications, collaborative communication platforms, and AI-based engagement assessment tools— are used as enablers of shared learning, cultural transparency, and human-centred organisational development. This integrated methodological approach ensures effective knowledge transfer to real professional environments and supports sustainable cultural change in line with the principles of Industry 5.0.

6. Core Methods

Method	Description and Educational Function
Interactive Lecture	Presentation of key concepts related to organisational culture, leadership, and change through dialogue and real-life examples. The instructor acts as a facilitator who guides participants' thinking and encourages discussion rather than delivering one-way instruction. The aim is to build understanding through participation and shared experience.
Simulations and Scenario-Based Training	Re-enactment of realistic situations from maritime, logistics, and corporate contexts, such as managing cultural conflict, onboard crises, technology implementation, or organisational restructuring. Participants assume roles and make decisions under pressure, developing strategic thinking, emotional resilience, and leadership flexibility during change.
Video Analysis and Observation	Use of authentic video materials and case examples illustrating organisational behaviour, team communication, and resistance to change. Behavioural patterns, non-verbal cues, and leadership responses are analysed to increase awareness of implicit dynamics and strengthen critical thinking.
Group Work and Facilitated Discussions	Participants work in small teams on concrete organisational tasks (e.g. culture redesign, change communication planning). The facilitator supports group dynamics through guiding questions, synthesis, and targeted feedback, fostering collaboration, mutual respect, and open dialogue.
Role Play	Participants assume predefined roles (e.g. captain, manager, officer, coordinator) and respond to scenarios involving organisational culture or change challenges. This method promotes empathy, perspective-taking, and constructive behaviour in high-tension situations.
Case Studies	Analysis of real or adapted cases from maritime, logistics, and corporate practice. Case-based learning enables participants to connect theory with practice, evaluate alternative solutions, and formulate strategic approaches to culture and change management.
Coaching and Group Facilitation	Integration of individual and team-based coaching elements. Through facilitated sessions, participants explore personal attitudes, values, and managerial decisions, developing self-awareness, personal responsibility, and leadership through meaning and support.

Method	Description and Educational Function
Technology Demonstrations and Digital Tools	Presentation of technological solutions supporting organisational culture, such as internal communication platforms, VR training simulations, digital engagement surveys, and AI-based feedback systems. This method encourages integration between innovation and the human factor, positioning technology as a catalyst for positive culture.
Team Simulations	Complex exercises in which multiple groups simultaneously address organisational challenges under time and resource constraints, including elements of intercultural interaction and distributed leadership. The method develops collaboration, trust, and decision-making capacity in uncertain environments.
Reflective Session and Awareness Journal	At the end of each training day, a facilitated reflection session enables participants to articulate insights, awareness, and application plans. An awareness journal supports individual self-assessment and experiential integration, ensuring deep learning and effective transfer to real managerial practice.

7. Methodology Summary

The training methodology is grounded in experiential and reflective learning, where knowledge emerges primarily from structured experience rather than from lecture-based instruction alone. Emphasis on *learning by doing* and *learning by reflection* supports the development of integrated competencies across cognitive, emotional, and social dimensions.

From an academic perspective, the applied methodology operationalises a human-centred educational model aligned with the principles of Industry 5.0, positioning technology and people as partners in organisational development. Through simulations, coaching, facilitation, and digital learning tools, the programme ensures active engagement, deep awareness, and sustainable transfer of learning to real managerial and maritime practice.

8. Expected Learning Outcomes

Upon completion of the programme, participants will be able to demonstrate the competences, knowledge, understanding and proficiency outlined below, assessed in accordance with the competence-based training and outcome-oriented assessment principles of the STCW Code, through defined methods for demonstrating competence and clear criteria for evaluating competence.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Identification and analysis of organisational culture in maritime and logistics contexts	Knowledge of organisational culture models (Schein, Hofstede) and their application in maritime environments. Understanding visible and invisible cultural elements, values, norms and behavioural patterns.	Case studies; group work; video analysis; organisational culture diagnostics; facilitated discussions.	Organisational culture elements are correctly identified and interpreted. Links between culture, behaviour, safety and performance are clearly articulated.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
	Proficiency in diagnosing organisational culture.		
Understanding cultural mechanisms influencing behaviour, safety and performance	Knowledge of implicit norms, rituals and unspoken rules shaping organisational dynamics. Understanding the relationship between culture, communication and safety. Proficiency in recognising cultural risks and strengths.	Simulations; video observation; reflective discussions; scenario analysis.	Participant demonstrates awareness of hidden cultural mechanisms and their impact on teamwork, safety and decision-making.
Application of human-centred change management models	Knowledge of change management frameworks (Schein, Kotter, ADKAR). Understanding emotional responses, resistance to change and participatory approaches. Proficiency in applying change models in a human-centred manner.	Change simulations; role play; case studies; group facilitation; coaching sessions.	Change strategies are appropriate, inclusive and ethically grounded. Resistance is addressed through communication, trust and engagement rather than coercion.
Leadership of cultural change through trust, communication and empathy	Knowledge of leadership roles in cultural transformation. Understanding the importance of trust, openness and meaning-making. Proficiency in leading change through example and dialogue.	Leadership simulations; role-based exercises; peer feedback; facilitator observation.	Leadership behaviour demonstrates empathy, transparency and responsibility. Communication supports alignment, trust and shared purpose.
Integration of technology as an enabler of organisational culture	Knowledge of digital tools (AI-based feedback systems, VR, collaborative platforms) supporting learning and engagement. Understanding technology as a cultural catalyst rather than a control mechanism. Proficiency in aligning technology with human values.	Technology demonstrations; practical exercises; simulations; group discussions.	Digital tools are used appropriately to enhance transparency, collaboration and learning culture. Human-centred values remain central.
Building and sustaining a culture of learning, trust and adaptability	Knowledge of organisational learning concepts and continuous improvement models. Understanding collective responsibility and shared values. Proficiency in fostering engagement and adaptability.	Team simulations; group facilitation; reflective sessions; final integrative exercise.	Participant supports a learning-oriented, trust-based environment. Behaviours encourage participation, accountability and continuous development.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Reflective self-awareness and leadership development in cultural change processes	Knowledge of reflective practice and leadership self-assessment. Understanding personal leadership impact on culture. Proficiency in setting development goals for cultural leadership.	Reflective journal; individual analytical assignment; coaching discussions.	Participant demonstrates critical self-reflection and formulates realistic, actionable leadership development objectives related to culture and change.

9. Structure of the TWO-Day Training Programme

Overall Training Framework

Day	Module / Main Focus	Learning Objectives	Key Methods
Day 1	**Module 1: Becoming Aware of Culture – Understanding Organisational Identity and Values**	To develop the ability to recognise both visible and invisible aspects of organisational culture, including values, beliefs, behaviours, and rituals. To increase awareness of cultural patterns influencing communication, safety, and team dynamics, and to cultivate sensitivity to the "pulse" of the organisation.	Interactive lecture, group discussions (*"What Does Our Culture Mean?"*), analysis of real-life examples, video analysis of organisational behaviour, facilitated debriefing, reflective session.
Day 2	**Module 2: Leading Change – Leadership, Technology, and the Human Factor**	To develop strategic and behavioural approaches to change management, focusing on trust, engagement, and adaptability during transformation. To understand the role of new technologies as enablers of learning culture, transparency, and participation, and to build skills for facilitating cultural evolution rather than imposing change.	Organisational change simulations, role play (*"The Captain and the Crew"*), case study analysis (technology implementation, digitalisation, hybrid work), technology demonstrations (digital feedback and collaboration tools), group facilitation, coaching elements, final reflective session.

10. Training Schedule

Day 1 – Module 1: Organisational Culture and the Human Dimension

Time	Session Topic	Content and Objectives	Training Methods
08:00 – 08:30	Introduction to Human-Centred Culture	Organisational culture as a "living system" of values, behaviours, and shared meanings.	Interactive lecture, group discussion
08:30 – 09:30	Types of Organisational Cultures (Schein, Hofstede)	Identification of key cultural models and their impact on the working environment.	Diagnostic tools, group work
09:30 – 10:30	Hidden Cultural Mechanisms	Awareness of unspoken rules, norms, and symbols shaping team behaviour.	Video analysis, facilitated debriefing
10:30 – 10:45	Coffee Break	—	—
10:45 – 12:00	Culture of Safety and Trust	Behavioural aspects of safety, responsibility, and collective accountability.	Simulation "Incident in Open Sea"
12:00 – 12:45	Lunch Break	—	—
12:45 – 14:15	How Culture Changes (Schein, Kotter)	Stages and approaches to cultural transformation and change management.	Interactive lecture, mini-workshop
14:15 – 15:15	The Role of Leaders as Cultural Carriers	Leadership influence through example, ethics, and communication.	Role-based simulations, coaching analysis
15:15 – 16:00	Reflection: My Team's Culture	Individual diagnosis and self-analysis of team culture.	Coaching session, reflective journal

Day 2 – Module 2: Change as an Opportunity

Time	Session Topic	Content and Objectives	Training Methods
08:00 – 08:45	Change in the Context of Industry 5.0	Exploring how technological and social factors reshape organisational structures and work environments.	Interactive lecture, video analysis

Time	Session Topic	Content and Objectives	Training Methods
08:45 – 09:45	Managing Resistance to Change	Identifying emotional barriers to change and developing strategies to address and overcome resistance.	Simulation "The Ship of Change"
09:45 – 10:30	Digital Communication and Feedback Culture	Using digital platforms to support open communication, inclusion, and continuous feedback.	Online simulation, facilitation
10:30 – 10:45	☕ Coffee Break	—	—
10:45 – 12:00	Technology as a Catalyst for Culture	Artificial intelligence, virtual reality, and gamification as enablers of learning and collaboration.	Demonstrations, hands-on work with interactive tools
12:00 – 12:45	🕛 Lunch Break	—	—
12:45 – 14:00	Leadership in Transformation and Crisis	Applying empathetic and human-centred leadership in conditions of uncertainty and change.	Coaching, facilitation
14:00 – 15:15	Building a Culture of Learning and Innovation	Models for continuous development, organisational learning, and innovation.	Collective session "The Team as an Ecosystem"
15:15 – 16:00	Final Simulation: "The Compass of Change"	Integrating leadership and technological elements in a realistic transformation scenario.	Simulation, group reflection, coaching

11. Certification and Assessment

- **Assessment format:** Active participation in learning activities (40%); individual analytical assignment "My Organisational Culture" (30%).
- **Final assessment:** Final integrative exercise "The Compass of Change" (30%).
- **Certification:** Certificate of Successful Completion of the programme "Organisational Culture and Change Management in the Era of Industry 5.0".

The certificate may be recognised as part of **Continuing Professional Development (CPD)** programmes in the maritime and logistics sectors.

12. Analysis and Academic Contributions of the Programme

Scientific and Conceptual Contribution

The programme "Organisational Culture and Change Management in the Era of Industry 5.0" introduces an innovative human-centred training model for the maritime and logistics sectors, integrating management practices, emotional intelligence, and digital tools for organisational development. It contributes to the development of a new

leadership paradigm in which leaders act as facilitators of cultural transformation, placing people at the centre of organisational evolution and positioning change as a strategic advantage.

Methodological Contribution

The programme combines established theoretical models of organisational learning and change management with experiential methods, including simulations, facilitated dialogue, and coaching techniques. The integration of digital technologies and analytical tools for assessing and monitoring cultural dynamics provides a contemporary methodological framework aligned with the principles of Industry 5.0 and supports evidence-based cultural transformation.

Applied and Organisational Contribution

The applied implementation of the programme demonstrates increased awareness of organisational culture as a key factor for sustainability, safety, and team effectiveness. Participants develop competencies for managing change through participation, trust, and collaboration, as well as practical skills for using technological solutions to support cultural development and internal communication.

Educational and Strategic Relevance

The programme contributes to the transformation of maritime education by introducing the concept of intelligent organisational culture, which integrates people, technology, and values into a unified system for sustainable development. It can serve as a model for Executive Education and professional development initiatives aimed at building human-centred leadership and organisational resilience in accordance with the principles of Industry 5.0.

Appendix 5

SPECIALISED EXPERIENTIAL EXECUTIVE TRAINING

"THE FLOWSTATE TRAINING"

COGNITIVE SYNCHRONY, COLLECTIVE INTELLIGENCE, AND PRESENCE IN THE MARITIME INDUSTRY

Experiential Executive Training for the Water Transport Sector, Developed in the Spirit of Industry 5.0

The FLOWSTATE Training Programme has been developed as part of the scholarly contribution of the monograph "Organisational Behaviour and Leadership in Maritime Transport". Its purpose is to provide a practical and applied implementation of the concept of human-centred learning in the era of Industry 5.0, translating theoretical models into an experiential and operational educational format.

1. Academic Profile of the Experiential Executive Training

FLOWSTATE Training is a specialised Executive Education programme developed as part of an integrated model for human factor development in the maritime industry (see Chapter Five). The training represents an applied operationalisation of a conceptual framework that has been empirically validated in Chapter Three and theoretically elaborated in Chapter Four of the study "Organisational Behaviour and Leadership in Maritime Transport".

The programme is designed to develop cognitive resilience, the capacity to act under pressure, and team synchrony in the context of dynamic and high-risk maritime operations. It is grounded in the concept of the psychological state of flow, conceptualised not as an individual experience, but as a collective state of synchrony between people, technologies, and organisational processes.

Unlike traditional simulation-based or leadership training programmes, FLOWSTATE Training explicitly designs for the emergence of flow and collective synchrony by integrating somatic regulation, cognitive alignment, and team-level awareness as core learning objectives rather than secondary outcomes.

2. Objectives of the Training

- To develop skills in **internal self-regulation**, **attention management**, and **emotional stability**;
- To support the development of **cognitive and behavioural resilience** when operating under pressure;
- To build **team synchrony**, **trust**, and a **shared rhythm of action**;
- To enhance the capacity for **collective decision-making** within complex systems;
- To integrate **conscious presence** as a core competence of maritime leadership in the era of **Industry 5.0**.

3. Target Group

The programme is designed for:

- Ship officers and command personnel;
- Managers and senior executives in maritime transport and logistics;
- Experts in security, operations, and risk management;
- Faculty members and trainers in maritime education;
- Professionals operating in environments characterised by high dynamics, complexity, and responsibility.

4. Format and Duration

- **Type of training:** Executive Education
- **Mode of delivery:** On-site or hybrid
- **Duration:** 1–2 training days (8–16 academic hours)
- **Learning approach:** Experiential and simulation-based learning, integrating cognitive, emotional, and technological components

5. Methodology and Curriculum Content

The educational approach of FLOWSTATE Training is experiential, interactive, and transformational. The programme is structured around the FLOWSTATE Training Triad, which reflects a developmental logic progressing from individual self-regulation to collective effectiveness:

I. Internal Regulation and Focus
Development of skills for managing attention, physiological responses, and emotional tension through **somatic and cognitive techniques**.

II. Team Synchrony
Cultivation of trust, coordination, and a shared rhythm of action through **group exercises, simulations, and facilitated teamwork**.

III. Presence in Action
Application of acquired skills within **realistic simulation scenarios**, involving decision-making under pressure, followed by **structured reflection and analysis**.

6. Core Methods

- Simulations of real-world maritime and logistics scenarios;
- Scenario-based learning and gamified missions;
- Facilitated team coaching in real time;
- Techniques for self-regulation and conscious presence;
- Analysis of team dynamics and communication processes;
- Structured reflection and debriefing.

7. Expected Learning Outcomes

Upon completion of the FLOWSTATE Training, participants will be able to demonstrate the competences, knowledge, understanding and proficiency outlined below, assessed in accordance with the competence-based training and outcome-oriented assessment principles of the STCW Code, through defined methods for demonstrating competence and clear criteria for evaluating competence.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Self-regulation and maintenance of psychophysiological stability under pressure	Knowledge of attention regulation, emotional and physiological responses to stress. Understanding the interaction between body, emotions and cognition under operational pressure. Proficiency in applying somatic and cognitive regulation techniques.	Simulation-based exercises; somatic regulation practices; behavioural observation; guided reflection.	Participant maintains focus and emotional stability under workload. Physiological and behavioural responses remain controlled and adaptive during pressure situations.
Sustained focus and attention management in high-demand operational environments	Knowledge of cognitive load, attentional limits and focus strategies. Understanding factors disrupting concentration in dynamic systems. Proficiency in maintaining task-relevant attention.	Cognitive regulation exercises; real-time simulations; observation during decision-making tasks.	Attention is sustained without significant distraction. Decisions remain clear, timely and relevant to situational demands.
Team synchrony and coordinated action in complex systems	Knowledge of team dynamics, coordination mechanisms and shared rhythm of action. Understanding interdependence between individual actions and collective performance. Proficiency in acting synchronously within a team.	Team-based simulations; synchrony exercises; facilitated observation; group debriefing.	Team actions are coordinated and mutually supportive. Communication and timing reflect shared situational awareness and collective rhythm.
Application of collective intelligence in decision-making under pressure	Knowledge of collective intelligence principles and distributed decision-making. Understanding how shared awareness enhances outcomes in complex systems. Proficiency in contributing to group decisions.	Scenario-based simulations; real-time decision-making tasks; After-Action Review (AAR).	Decisions demonstrate integration of multiple perspectives. Collective solutions are coherent, adaptive and situationally appropriate.
Conscious presence and situational awareness in action	Knowledge of presence as a leadership and operational competence. Understanding the link between awareness, perception and effective action. Proficiency in maintaining presence during dynamic events.	High-pressure simulations; behavioural observation; reflective analysis.	Participant remains present and responsive rather than reactive. Situational awareness is maintained throughout operational scenarios.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Integration of human and technological elements in operational performance	Knowledge of the interaction between human factors and technological systems. Understanding technology as a supportive and mediating element. Proficiency in aligning human judgement with technological inputs.	Simulation scenarios with technological feedback; data-driven observation; facilitated analysis.	Technology is used effectively without over-reliance. Human judgement remains central and aligned with system feedback.
Reflective awareness and transfer of experiential learning to practice	Knowledge of reflective practice and experiential learning cycles. Understanding personal and team behaviour patterns. Proficiency in translating experience into actionable insights.	Guided reflection; learning journal; peer feedback; facilitator-led debriefing.	Participant demonstrates deep reflection, accurate self-assessment and clear articulation of learning transfer to real operational contexts.

8. Conceptual Validation and Applied Relevance

FLOWSTATE Training has been developed as a practical dimension of the integrated human factor development model empirically validated in Chapter Three of the study. Its focus on self-regulation, cognitive resilience, and team synchrony reflects empirically confirmed relationships between attention, emotional stability, communication, and the effectiveness of maritime teams.

The programme is conceptually aligned with the human-centred leadership model elaborated in Chapter Four, demonstrating how optimal performance emerges from a balanced interaction between human capabilities and technological support. The validation of FLOWSTATE Training is theoretical–applied and methodological in nature, with future empirical testing envisaged through pilot implementation and evaluation based on the Kirkpatrick model.

9. Training Design and Learning Roadmap

FLOWSTATE Training
"Cognitive Synchrony, Collective Intelligence, and Presence in Action"
Duration: 1 day / 8 academic hours
Format: Executive Education – experiential and simulation-based learning

10. General Framework of the Training

Stage / Module	Primary Focus	Learning Objectives	Key Methods
Module 1	Internal Regulation and Focus	Development of attention, psychophysiological stability, and self-regulation	Somatic techniques, cognitive exercises, guided focus
Module 2	Team Synchrony	Building trust, coordination, and a shared rhythm of action	Group tasks, team-based simulations, facilitation

Stage / Module	Primary Focus	Learning Objectives	Key Methods
Module 3	Presence in Action	Application of acquired skills in dynamic, high-pressure scenarios	Realistic simulations, real-time decision-making
Module 4	Reflection and Integration	Sense-making of the experience and transfer to practice	Debriefing, analysis, structured reflection

11. Detailed Training Schedule

Time	Module / Topic	Content and Objectives	Methods
08:30 – 09:00	Opening and Introduction	Presentation of the training objectives, the concept of flow, and the logic of the simulation	Interactive lecture, facilitated dialogue
09:00 – 10:15	**MODULE 1: Focus and Internal Regulation**	Management of attention, emotions, and physiological responses under pressure	Breathing techniques, cognitive regulation, micro-exercises
10:15 – 10:30	☕ Coffee Break	—	—
10:30 – 12:00	**MODULE 2: Team Synchrony**	Building trust, rhythm, and coordination within the group	Team challenges, facilitated group dynamics
12:00 – 12:45	🕛 Lunch Break	—	—
12:45 – 14:45	**MODULE 3: Presence in Action**	Work on a simulated maritime/logistics scenario; decision-making under pressure	Real-time simulation, role-based functions, visualised feedback
14:45 – 15:00	☕ Short Break	—	—
15:00 – 16:00	**MODULE 4: Reflection and Analysis**	Sense-making of the experience; analysis of team dynamics and individual behaviour	Debriefing, group reflection, analytical questioning

12. Methods of Training in Flowstate Training

Method	Description	Educational and Functional Role
Simulation-Based Learning	Realistic simulations of maritime and logistics scenarios with dynamic variables and time constraints	Develops decision-making under pressure, situational awareness, and systems thinking
Experiential Learning	Learning through individual and team experience rather than instruction	Transforms knowledge into intuitive competence; supports deep learning
Somatic Regulation Techniques	Breathing, body-based, and focus techniques for managing physiological activation	Enhances self-regulation, resilience, and attentional control

Method	Description	Educational and Functional Role
Cognitive Regulation Exercises	Short cognitive interventions for managing thought patterns and focus	Reduces cognitive overload and enhances clarity of thinking
Team Synchrony Exercises	Group tasks requiring coordination, rhythm, and mutual interdependence	Builds trust, shared responsibility, and collective intelligence
Facilitated Team Coaching	Facilitated interventions during simulations without direct provision of solutions	Encourages leadership without formal authority and team self-regulation
Real-Time Decision-Making	Decision-making under conditions of limited time and incomplete information	Develops adaptability, prioritisation, and accountability
Gamified Scenario Design	Scenarios incorporating game elements, indicators, and consequences	Increases engagement and awareness of cause–effect relationships
Data-Driven Feedback	Visualised feedback through indices and analytical indicators	Provides an objective perspective on team dynamics and behaviour
Biofeedback Elements	Monitoring of attention and physiological activation (where available)	Supports awareness of the relationship between body, emotions, and performance
Guided Reflection	Structured group and individual reflection after each phase	Transforms experience into conscious knowledge and applicable competence
After-Action Review (AAR)	Analysis of actions following completion of the simulation	Enhances learning from experience and critical thinking
Peer Learning	Exchange of perspectives and feedback among participants	Develops empathy, communication, and a collective perspective
Visual Mapping & Flow Mapping	Visual tracking of processes, decisions, and dynamics	Supports systems thinking and knowledge integration
Reflective Questioning	Facilitated questions for making sense of the experience	Supports transfer to real professional practice

13. Methodological Summary

The methodology of FLOWSTATE Training is grounded in experiential and simulation-based learning, integrating cognitive, emotional, and somatic processes within conditions of realistic operational dynamics. The educational approach combines techniques for internal self-regulation, team synchrony, and decision-making under pressure, placing participants in an active role within complex maritime and logistics scenarios.

The training is structured to create a balance between environmental challenges and the individual and collective capacities of participants, thereby supporting the emergence of flow states and collective intelligence. A key element of the methodology is

the use of facilitated feedback and structured reflection, through which lived experience is transformed into conscious and applicable knowledge.

In line with the principles of human-centred learning in Industry 5.0, FLOWSTATE Training positions technology as a supportive tool for visualisation, analysis, and decision-making, with effectiveness achieved through synchrony between the human factor and the systemic environment.

14. Certification and Assessment

Assessment within FLOWSTATE Training is oriented towards the experiential learning process and the active participation of trainees in simulation-based and team-based activities. It combines behavioural observation, analysis of team dynamics, and individual reflection, with a strong emphasis on the development of human-centred and collective competencies. The effectiveness of FLOWSTATE Training is evaluated through a set of qualitative and quantitative indicators designed to capture both individual and collective dimensions of performance. Core metrics include the **Flow Index**, reflecting the balance between perceived challenge and individual capacity under operational conditions; the **Emotional Stability Score**, assessing the ability to regulate physiological and emotional responses under pressure; and the **Team Clarity Metric**, measuring shared situational awareness, communication transparency, and coordination within the team.

These indicators are monitored through facilitated observation, structured self-assessment, and, where applicable, biofeedback-supported data, allowing participants to develop conscious awareness of their internal states and their impact on collective performance.

15. Analysis and Academic Conclusions from the Specialised Training

FLOWSTATE Training represents an innovative applied model for human factor development in the maritime industry, advancing traditional training approaches through the integration of cognitive, emotional, and somatic processes within a realistic simulation-based environment. The programme translates theoretical constructs of flow, collective intelligence, and human-centred leadership into a practically applicable training framework aligned with the principles of Industry 5.0.

The training is designed as a progressive developmental process—from internal self-regulation and focused attention, through team synchrony, to effective presence in action—reflecting empirically validated relationships between attention, emotional stability, communication, and team performance. A key academic contribution lies in positioning technology as a mediating and supportive element, enhancing human awareness and collective decision-making rather than replacing human competence.

In conclusion, FLOWSTATE Training constitutes a scientifically grounded and methodologically coherent Executive Education model for maritime and logistics practice, while also providing a foundation for future empirical research on collective intelligence, team synchronisation, and cognitive resilience in technology-intensive operational environments.

Appendix 6

SPECIALISED EXPERIENTIAL EXECUTIVE TRAINING

"THE HUMANCODE TRAINING"

COMMUNICATION, INFLUENCE, AND SOCIAL INTELLIGENCE IN MULTINATIONAL, HYBRID & HIGH-RISK MARITIME ENVIRONMENTS

Experiential Executive Training for the Water Transport Sector, Developed in the Spirit of Industry 5.0

The HUMANCODE Training Programme has been developed as part of the scholarly contribution of the monograph "Organisational Behaviour and Leadership in Maritime Transport". Its purpose is to provide a practical and applied implementation of the concept of human-centred learning in the era of Industry 5.0, translating theoretical models into an experiential and operational educational format.

1. Academic Profile of the Experiential Executive Training

HUMANCODE Training is a specialised experiential Executive Education programme focused on the develo, authentic communication, and ethical influence in multinational, hybrid, and high-risk maritime environments.pment of social and emotional intelligence

Unlike training formats that prioritise cognitive–behavioural techniques or technical communication skills, HUMANCODE Training develops the capacity to decode emotional and behavioural signals, build trust-based relationships, and influence through presence and connection rather than formal authority.

Conceptually, the programme is grounded in established models of emotional and social intelligence, contemporary research on emotions in team processes, and trust and collaboration in hybrid and distributed teams. Methodologically, HUMANCODE transforms social interaction into an observable, interpretable, and developable process through structured experience and reflection.

2. Objectives of the Training

The primary objectives of HUMANCODE Training are:

- To develop emotional awareness and self-regulation in interpersonal and team interactions;
- To enhance the ability to decode emotional, behavioural, and non-verbal signals in professional contexts;
- To strengthen trust, empathy, and relational coordination within maritime teams;
- To develop ethical and authentic influence as a core leadership competence;
- To integrate social intelligence as a key dimension of human-centred leadership in Industry 5.0.

3. Target Group

The programme is designed for:

- Ship officers and command personnel;
- Managers and senior executives in maritime transport and logistics;
- Leaders operating in multinational, multicultural, and hybrid teams;
- Trainers, educators, and facilitators in maritime education;
- Professionals working in environments characterised by high responsibility, interpersonal complexity, and safety-critical communication.

4. Format and Duration

- **Type of training:** Executive Education
- **Mode of delivery:** On-site or hybrid
- **Duration:** 1–2 training days (8–16 academic hours)
- **Learning approach:** Experiential, relational and reflective learning

5. Methodology and Curriculum Content

HUMANCODE Training follows a **triadic developmental structure**, reflecting the progression from internal awareness to interpersonal impact and ethical influence:

I. Decode – Internal and Interpersonal Awareness

Development of the ability to recognise and interpret emotional states, behavioural patterns, and non-verbal communication cues in oneself and others.

II. Connect – Trust and Relational Synchrony

Cultivation of empathy, psychological safety, and trust through facilitated dialogue, role-based interaction, and experiential group processes.

III. Influence – Ethical Impact and Leadership Presence

Application of acquired competencies in complex communication scenarios requiring influence without authority, ethical decision-making, and relational leadership.

This structure reflects the HUMANCODE Training Triad:
Decode – Connect – Influence

6. Core Methods

- Role-based communication scenarios and simulations;
- Dramaturgical and psychodramatic techniques for self-awareness and expression;
- Facilitated dialogue and team coaching;
- Group-based emotional profiling and reflective tools;
- Guided individual reflection and personal development planning.

Through these methods, communication is reframed not as a technical skill, **but as a state of conscious interpersonal connectedness**.

7. Expected Learning Outcomes

Upon completion of the HUMANCODE Training, participants will be able to demonstrate the competences, knowledge, understanding and proficiency outlined below, assessed in accordance with the competence-based training and outcome-oriented assessment principles of the STCW Code, using defined methods for demonstrating competence and clear criteria for evaluating competence.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Emotional awareness and self-regulation in interpersonal communication	Knowledge of emotional processes and their influence on behaviour and communication. Understanding personal emotional triggers and regulation mechanisms. Proficiency in maintaining emotional balance during interaction.	Emotional decoding exercises; role-based scenarios; behavioural observation; guided reflection.	Emotional responses are recognised and regulated appropriately. Communication remains calm, clear, and respectful under interpersonal pressure.
Interpretation of non-verbal and emotional signals in professional contexts	Knowledge of non-verbal communication cues, emotional signals and behavioural patterns. Understanding implicit messages in interaction. Proficiency in accurately decoding interpersonal signals.	Observation tasks; Mirror Room exercises; peer feedback; facilitated analysis.	Non-verbal and emotional cues are correctly identified and interpreted. Responses demonstrate sensitivity and situational awareness.
Trust-building and relational coordination within teams	Knowledge of trust dynamics, psychological safety and relational coordination. Understanding how trust influences performance and safety. Proficiency in fostering empathetic and supportive relationships.	Forum Theatre simulations; group interaction tasks; facilitated dialogue.	Interactions promote trust, openness and mutual respect. Participant contributes to psychological safety and relational clarity within the group.
Ethical and authentic influence without formal authority	Knowledge of ethical influence principles and leadership presence. Understanding the distinction between influence, manipulation and authority. Proficiency in influencing through authenticity and connection.	Influence simulations; ethical dilemma scenarios; peer feedback; facilitator observation.	Influence is exercised transparently and ethically. Behaviour demonstrates authenticity, respect and responsibility.
Integration of social and emotional intelligence into leadership practice	Knowledge of emotional and social intelligence frameworks. Understanding their relevance to leadership effectiveness and organisational resilience. Proficiency in applying these competencies in leadership behaviour.	Leadership communication scenarios; reflective dialogue; personal development planning.	Leadership behaviour reflects empathy, social awareness and ethical judgement. Interpersonal impact is constructive and aligned with human-centred values.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Conscious interpersonal presence in high-responsibility environments	Knowledge of presence as a communicative and leadership competence. Understanding the impact of tone, posture, voice and attention. Proficiency in maintaining presence during complex interactions.	Role-based simulations; dramaturgical techniques; behavioural observation.	Participant demonstrates grounded presence, attentive listening and consistent interpersonal impact in demanding situations.
Reflective awareness and transfer of relational learning to practice	Knowledge of reflective learning and self-assessment tools. Understanding personal communication patterns and their effects. Proficiency in formulating development goals.	Structured debriefing; reflective dialogue; HumanCode Profile development.	Participant demonstrates critical self-reflection and formulates realistic, applicable interpersonal development objectives.

8. Conceptual Validation and Applied Relevance

HUMANCODE Training has been developed as a practical implementation of the integrated human factor model empirically validated in Chapter Three and theoretically elaborated in Chapter Four of the study.

Its focus on emotional intelligence, trust, and ethical influence reflects empirically established relationships between emotions, communication quality, leadership effectiveness, and team performance in complex operational environments.

The validation of HUMANCODE Training is conceptual and methodological in nature. Future empirical testing is envisaged through pilot implementation and evaluation based on the Kirkpatrick four-level model, allowing systematic assessment of learning, behavioural change, and organisational impact.

9. Training Design and Learning Roadmap

HUMANCODE Training
"Communication, Influence, and Social Intelligence in the Maritime Industry"
Duration: 1 day / 8 academic hours
Format: Executive Education – experiential and simulation-based learning

10. General Framework of the Training

Stage / Module	Primary Focus	Learning Objectives	Key Methods
Module 1	Decode – Emotional and Social Awareness	Development of emotional awareness, recognition of behavioural patterns, and interpretation of verbal and non-verbal signals in professional interaction	Emotional decoding exercises, role observation, guided self-assessment, non-verbal communication tasks

Stage / Module	Primary Focus	Learning Objectives	Key Methods
Module 2	Connect – Trust and Relational Synchrony	Building trust, empathy, and psychological safety; strengthening relational coordination and shared understanding within teams	Role-based simulations, facilitated dialogue, group interaction tasks, dramaturgical techniques
Module 3	Influence – Ethical Impact in Action	Application of communication and relational competencies to influence decision-making and leadership processes without formal authority	Leadership communication simulations, influence scenarios, ethical dilemmas, peer feedback
Module 4	Reflection and Integration	Sense-making of experience and integration of insights into individual leadership practice and organisational context	Structured debriefing, reflective dialogue, personal development planning

11. Detailed Training Schedule

Time	Module	Activity / Tool	Content	Method
08:30 – 09:00	Opening & Orientation	—	Introduction to HUMANCODE; Decode–Connect–Influence framework; rules for psychological safety	Interactive lecture, facilitated dialogue
09:00 – 10:15	**MODULE 1: Decode**	**Emotion Cards**	Working with emotional states and "emotional filters"; awareness of the impact of emotions on communication and behaviour	Emotional decoding exercises, guided self-assessment
10:15 – 10:30	☕ Coffee Break	—	—	—
10:30 – 12:00	**MODULE 2: Connect**	**Forum Theatre**	Interactive scenes based on real professional situations; analysis of trust, empathy, and communication blockages through role experience	Dramaturgical techniques, role-based simulations, facilitated dialogue
12:00 – 12:45	⏲ Lunch Break	—	—	—
12:45 – 13:45	**MODULE 3: Influence**	**Mirror Room**	Observation and analysis of participants' own non-verbal communication; reflection on tone, gestures, presence, and interpersonal impact	Observation, peer feedback, reflective mirroring
13:45 – 14:45	**MODULE 3: Influence**	**Story Impact Lab**	Storytelling as a tool for leadership influence; formulation and delivery of messages through narrative	Leadership communication simulations, influence scenarios
14:45 – 15:00	☕ Short Break	—	—	—

Time	Module	Activity / Tool	Content	Method
15:00 – 16:00	**MODULE 4: Reflection & Integration**	—	Structured debriefing; integration of learning; formulation of a personal HumanCode Profile	Reflective dialogue, personal development planning

12. Methods of Training in Humancode Training

Method	Description	Educational and Functional Role
Simulation-Based Communication Scenarios	Realistic simulations of critical communication situations in maritime and logistics environments	Develops situational awareness, emotional decoding, and adaptive communication under pressure
Experiential Learning	Learning through direct individual and group experience rather than instruction	Transforms communication from a technical skill into an embodied and relational competence
Role-Based Interaction	Structured role assignments reflecting leadership, followership, and conflict positions	Enhances perspective-taking, empathy, and understanding of interpersonal dynamics
Dramaturgical and Psychodramatic Techniques	Use of theatrical methods to explore emotional expression, voice, posture, and presence	Increases emotional awareness, authenticity, and expressive clarity
Facilitated Dialogue	Guided group conversations focused on meaning-making and relational processes	Builds trust, psychological safety, and shared understanding
Emotional Decoding Exercises	Activities aimed at recognising emotions, intentions, and behavioural signals	Develops emotional intelligence and non-verbal sensitivity
Ethical Influence Scenarios	Simulations requiring influence without formal authority	Strengthens ethical decision-making, persuasion, and relational leadership
Peer Feedback and Mirroring	Structured feedback among participants based on observed behaviour	Enhances self-awareness and reflective learning
Reflective Learning and Debriefing	Guided reflection following each experiential phase	Transforms experience into conscious knowledge and applicable leadership practice
Personal Development Planning	Individual formulation of insights and future behavioural intentions	Supports transfer of learning to real professional contexts
Group Assessment and Emotional Profiling Tools	Use of qualitative and semi-quantitative tools for assessing emotional and relational dynamics	Makes interpersonal processes observable, discussable, and developable

13. Methodological Summary

The methodology of HUMANCODE Training is grounded in experiential and relational learning, integrating emotional, social, and ethical dimensions of human interaction within realistic professional contexts. The training design positions communication as a dynamic interpersonal process, shaped by emotional awareness, trust, and presence.

By combining simulation-based scenarios, dramaturgical techniques, and facilitated reflection, HUMANCODE enables participants to decode human interaction, build relational synchrony, and exercise ethical influence. In line with the principles of human-centred leadership in Industry 5.0, technology—where used—functions as a supportive element for observation and feedback, while effectiveness emerges primarily through human connection and relational intelligence.

14. Certification and Assessment

Assessment within HUMANCODE Training is focused on the experiential learning process and participants' active involvement in communication-based and relational activities. Evaluation combines behavioural observation, reflective self-assessment, and peer feedback, with emphasis on the development of social, emotional, and ethical leadership competencies.

Certification is awarded upon full participation in the training programme and completion of all experiential modules, confirming competencies in emotional awareness, trust-based communication, and ethical influence.

Training effectiveness is assessed through selected qualitative and semi-quantitative indicators, including:

- **Emotional Awareness Index;**
- **Trust and Relational Clarity Indicator;**
- **Communication Presence Score;**
- **Ethical Influence Metric.**

Assessment is supported by facilitated observation and structured reflection, prioritising developmental feedbackover summative evaluation. In line with human-centred learning in Industry 5.0, the assessment process aims to increase participants' awareness of their interpersonal impact and the role of communication in organisational trust and resilience.

15. Analysis and Academic Conclusions from the Specialised Training

HUMANCODE Training represents an applied model for the development of social and emotional intelligence in the maritime industry, extending traditional communication training through an experiential, relational, and ethically grounded approach. The programme translates theoretical constructs of emotional intelligence, trust, and ethical influence into a structured training framework aligned with the principles of human-centred leadership in Industry 5.0.

The training follows a progressive developmental logic—from emotional awareness and relational connection to intentional interpersonal influence—reflecting empirically supported relationships between emotions, communication quality, trust, and leadership effectiveness in complex organisational environments. A key academic contribution lies

in conceptualising communication as an observable and developable social process, rather than a purely technical competence.

In conclusion, HUMANCODE Training constitutes a methodologically coherent and scientifically grounded Executive Education model, providing both practical relevance for maritime organisations and a foundation for future empirical research on trust, social intelligence, and ethical leadership in high-risk and multicultural operational settings

Appendix 7

SPECIALIZED EXPERIENTIAL EXECUTIVE TRAINING

"THE DEEPWATER TRAINING"

LEADERSHIP AND RESILIENCE IN A REAL MARITIME ENVIRONMENT

Experiential Executive Training for the Water Transport Sector, Developed in the Spirit of Industry 5.0

The DEEPWATER Training has been developed as part of the scholarly contribution of the monograph "Organisational Behaviour and Leadership in Maritime Transport". Its purpose is to provide a practical and applied implementation of the concept of human-centred learning in the era of Industry 5.0, translating theoretical models into an experiential and operational educational format.

1. Academic Profile of the Experiential Executive Training

DEEPWATER Training is a specialised experiential Executive Education programme focused on the development of leadership resilience, conscious presence, and responsible decision-making in real maritime and high-risk environments.

Unlike training formats that rely primarily on classroom instruction or controlled simulations, DEEPWATER Training places participants in a real maritime context, where environmental exposure, uncertainty, and limited resources reveal automatic reactions, stress patterns, and leadership behaviour as they emerge in real time.

Conceptually, the programme is grounded in research on stress regulation, resilience, and human-centred leadership in high-risk systems. Methodologically, DEEPWATER transforms environmental pressure into a structured learning resource, enabling leadership behaviour to be observed, reflected upon, and consciously developed through experience and facilitated analysis.

2. Objectives of the Training Programme

The primary objectives of DEEPWATER Training are:

- To develop the capacity for self-regulation and emotional stability under conditions of stress and environmental uncertainty;
- To enhance conscious presence and situational awareness in high-risk maritime contexts;
- To strengthen responsible decision-making and leadership accountability under pressure;
- To support the development of resilience and ethical judgement in complex and unpredictable situations;
- To translate inner stability into effective leadership action that promotes safety, trust, and team coherence.

3. Target Group

The programme is designed for:

- ship officers and command personnel operating in high-risk maritime environments;
- managers and team leaders in maritime transport and logistics;
- professionals in security, operations, and risk management;
- educators, trainers, and faculty members in maritime education;
- professionals working in contexts characterized by uncertainty, environmental exposure, and high responsibility.

4. Format And Duration

- **Type of training:** Experimental Executive Education
- **Mode of delivery:** On-site (outdoor, real maritime environment)
- **Duration:** 2 training days (16 academic hours)
- **Learning approach:** Experiential and scenario-based learning, integrating environmental exposure, stress regulation, and facilitated reflection.

5. Methodology and Curriculum Content

The educational approach of DEEPWATER Training is **experiential, situational, and reflective**. The programme is structured around a three-phase developmental logic that reflects the progression from reactivity to responsible leadership under pressure:

Phase I – Immersion (Dive)

Participants are immersed in a real maritime environment and scenario, where uncertainty, limited resources, and environmental exposure reveal automatic reactions, stress responses, and behavioural patterns.

Phase II – Regulation (Breathe)

Through somatic and cognitive techniques, participants develop the capacity for stress regulation, emotional stability, and conscious presence, enabling a transition from reaction to choice.

Phase III – Leadership Action (Lead)

Internal stability is translated into responsible decision-making, ethical leadership, and team-oriented action under pressure.

The curriculum integrates environment-based simulations, controlled stress exposure, and facilitated reflection, transforming lived experience into conscious leadership competence applicable to high-risk maritime contexts.

6. Core Methods

- real maritime and environment-based simulations;
- scenario-driven missions and decision-making under pressure;
- controlled stress-exposure exercises adapted to outdoor conditions;
- somatic and cognitive regulation techniques;
- facilitated group observation and behavioural analysis;
- structured reflection and guided debrief sessions.

7. Expected Learning Outcomes

Upon completion of the DEEPWATER Training, participants will be able to demonstrate the competences, knowledge, understanding and proficiency outlined below, assessed in accordance with the competence-based training and outcome-oriented assessment principles of the STCW Code, using defined methods for demonstrating competence and clear criteria for evaluating competence in real maritime and high-risk environments.

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
Recognition and regulation of psychophysiological responses under stress	Knowledge of stress responses, physiological activation and emotional regulation mechanisms. Understanding how environmental pressure affects perception and behaviour. Proficiency in applying somatic and cognitive regulation techniques.	Environment-based simulations; controlled stress-exposure exercises; behavioural observation; guided reflection.	Participant recognises stress reactions and applies regulation techniques effectively. Emotional and physiological responses remain functional under pressure.
Maintenance of conscious presence and situational awareness in high-risk maritime contexts	Knowledge of presence, attention control and situational awareness. Understanding the relationship between awareness, safety and decision quality. Proficiency in remaining present in dynamic and uncertain environments.	Real maritime scenarios; observation during missions; facilitated debriefing.	Participant remains attentive and responsive rather than reactive. Situational awareness is maintained despite environmental and time pressure.
Responsible and ethical decision-making under uncertainty	Knowledge of ethical decision-making principles and leadership accountability. Understanding moral complexity and trade-offs in high-risk situations. Proficiency in making decisions under uncertainty.	Scenario-driven missions; ethical decision exercises; After-Action Review (AAR).	Decisions are timely, responsible and ethically grounded. Accountability for consequences is demonstrated.
Demonstration of resilient leadership behaviour in unpredictable conditions	Knowledge of resilience, leadership under pressure and adaptive behaviour. Understanding the link between inner stability and leadership	Role-based team dynamics; environment-based simulations;	Leadership behaviour remains stable, adaptive and supportive. Actions promote safety, trust

Competence	Knowledge, Understanding and Proficiency	Methods for Demonstrating Competence	Criteria for Evaluating Competence
	effectiveness. Proficiency in leading through example under stress.	facilitator observation.	and coordination within the team.
Translation of internal stability into effective team-oriented leadership action	Knowledge of team dynamics and trust-building in high-risk environments. Understanding how regulated leadership behaviour influences team coherence. Proficiency in aligning personal stability with collective action.	Team coordination tasks; multi-team simulations; group analysis.	Team actions are coherent and coordinated. Participant's behaviour supports trust, clarity and collective effectiveness.
Integration of experiential learning through reflection and sense-making	Knowledge of reflective practice and experiential learning cycles. Understanding personal leadership patterns revealed under pressure. Proficiency in transforming experience into insight.	Facilitated group reflection; behavioural mapping; personal reflection artefact ("My Deep Decision").	Participant demonstrates deep reflection, accurate self-assessment and clear articulation of learning transfer to professional practice.

8. Conceptual Validation and Applied Relevance

DEEPWATER Training is developed as an applied operationalisation of the integrated human factor model presented in this study. The programme reflects empirically confirmed relationships between stress regulation, leadership behaviour, and decision-making under pressure, as established in Chapter Three, and applies the principles of human-centred leadership elaborated in Chapter Four.

The validation of DEEPWATER Training is conceptual and methodological in nature. Through its structure, methods, and real-environment design, the programme demonstrates the practical applicability of the model in high-risk maritime contexts and provides a foundation for future empirical testing through pilot implementation and multi-level evaluation.

9. Training Design and Learning Roadmap

DEEPWATER Training
"Leadership and Resilience in a Real Maritime Environment"
Duration: 2 days / 16 academic hours
Type of training: Experimental Executive Education (scenario-based)

10. General Framework of the Training

Stage / Module	Primary Focus	Learning Objectives	Key Methods
Module 1 – Immersion (Dive)	Exposure to real maritime conditions and uncertainty	Awareness of stress reactions, behavioural patterns, and leadership impulses under pressure	Environment-based simulations, scenario immersion, observation
Module 2 – Regulation (Breathe)	Stress regulation and conscious presence	Development of emotional stability, attention control, and self-regulation	Somatic and cognitive regulation techniques, guided exercises
Module 3 – Leadership Action (Lead)	Responsible leadership under pressure	Ethical decision-making, accountability, and team-oriented action	Scenario-driven missions, team decision-making, facilitated leadership tasks
Module 4 – Reflection and Integration	Sense-making and transfer to practice	Integration of experience into conscious leadership competence	Structured debriefing, group analysis, guided reflection

11. Detailed Training Schedule

Day 1 – Immersion and Regulation

Time	Phase / Module	Focus and Learning Objectives	Illustrative Activities
08:30 – 09:00	Opening & Orientation	Introduction to the training logic, safety framework, and scenario context	Scenario briefing **"After the Storm"**, role allocation
09:00 – 10:30	**Phase I – Immersion (Dive)**	Awareness of stress reactions, leadership impulses, and group dynamics	Environment-based simulation; survival and coordination task
10:30 – 10:45	☕ Coffee Break	—	—
10:45 – 12:15	**Phase I – Immersion (Dive)**	Observation of behavioural patterns under uncertainty	Resource-allocation dilemma; navigation and orientation task
12:15 – 13:00	🕛 Lunch Break	—	—
13:00 – 14:30	**Phase II – Regulation (Breathe)**	Development of emotional stability and conscious presence	Breathing and grounding exercises (Grounding under Pressure); guided focus practice
14:30 – 14:45	☕ Short Break	—	—
14:45 – 16:00	**Phase II – Regulation (Breathe)**	Application of regulation skills under moderate stress	Controlled stress exposure; communication challenge with time constraints

Day 2 – Leadership Action and Integration

Time	Phase / Module	Focus and Learning Objectives	Illustrative Activities
08:30 – 09:00	Re-entry & Reflection	Re-activation of insights from Day 1	Guided group reflection; Circle Dialogue
09:00 – 10:30	**Phase III – Leadership Action (Lead)**	Responsible decision-making and ethical leadership	Scenario-driven mission; **Decision Cards** with ethical dilemmas
10:30 – 10:45	☕ Coffee Break	—	—
10:45 – 12:15	**Phase III – Leadership Action (Lead)**	Team coordination and accountability under pressure	Multi-team coordination task; simulated rescue decision
12:15 – 13:00	🕛 Lunch Break	—	—
13:00 – 14:30	**Phase IV – Reflection and Integration**	Sense-making and transfer to professional practice	After-Action Review; behavioural mapping
14:30 – 14:45	☕ Short Break	—	—
14:45 – 16:00	Closing & Integration	Consolidation of learning and leadership insight	Personal reflection artefact **"My Deep Decision"**; closing circle

12. Methods of Training in Deepwater Training

Method	Description	Educational and Functional Role	Illustrative Activities / Examples
Environment-Based Simulation	Real maritime scenarios conducted in outdoor conditions	Reveals authentic stress reactions and leadership behaviour under pressure	Scenario **"After the Storm"**; survival and coordination tasks in real terrain
Scenario-Driven Missions	Missions unfolding through uncertainty, limited resources, and time pressure	Develops decision-making, prioritisation, and accountability	Resource-allocation dilemmas; rescue-choice scenarios; navigation tasks
Role-Based Team Dynamics	Participants assume operational and leadership roles	Enables observation of leadership emergence and group behaviour	Roles such as *captain,* communicator, *logistician, mediator*
Controlled Stress Exposure	Gradual increase of cognitive, emotional, and environmental load	Builds resilience and tolerance to uncertainty	Communication breakdowns; time-constrained decisions; simulated crises
Somatic Regulation Techniques	Body-based techniques for stress and attention regulation	Supports emotional stability and conscious presence	Breathing and grounding exercises (*Grounding under Pressure*)

Method	Description	Educational and Functional Role	Illustrative Activities / Examples
Ethical Decision Exercises	Structured moral dilemmas embedded in the scenario	Develops ethical judgement under pressure	**Decision Cards** with ethical trade-offs
Facilitated Group Reflection	Guided analysis of experience and behaviour	Transforms experience into conscious learning	Evening reflection ritual; Circle Dialogue; After-Action Review
Symbolic and Reflective Tools	Use of symbols to anchor learning and insight	Enhances meaning-making and retention	Personal reflection artefact (*"My Deep Decision"*)

13. Methodological Summary

The methodology of DEEPWATER Training is grounded in **experiential and environment-based learning**, where real maritime conditions function as an active methodological component rather than a neutral setting. Through environment-based simulations and scenario-driven missions, participants are exposed to uncertainty, limited resources, and time pressure, allowing authentic stress reactions, leadership behaviours, and group dynamics to emerge naturally.

A central methodological principle of the programme is the **progressive exposure to stress**, combined with structured opportunities for regulation and reflection. Controlled stress-exposure exercises are integrated with somatic regulation techniques, enabling participants to develop emotional stability, conscious presence, and resilience while remaining actively engaged in complex tasks. Leadership is observed not as a formal role, but as an emergent process shaped by context, responsibility, and interaction.

Ethical decision exercises and role-based team dynamics further deepen the learning process by introducing moral complexity and distributed responsibility. Learning is consolidated through facilitated group reflection and symbolic tools, which transform lived experience into conscious insight and transferable leadership competence. In this way, DEEPWATER Training translates environmental pressure into a **structured methodological resource** for the development of resilient, ethical, and human-centred leadership in high-risk maritime environments.

14. Certification and Assessment

Assessment within DEEPWATER Training is oriented towards the experiential learning process and active participation of participants in scenario-based and team-based activities. Evaluation focuses on the observation of leadership behaviour, stress regulation, and decision-making under pressure rather than on formal testing.

The assessment framework combines facilitated behavioural observation, structured self-reflection, and group feedback, allowing participants to develop conscious awareness of their responses and their impact on team dynamics. Certification is awarded upon full participation and completion of all training phases, confirming engagement with the experiential and reflective components of the programme.

15. Analysis and Academic Conclusions from the Specialised Training

DEEPWATER Training represents an applied experiential model for leadership development in high-risk maritime environments, extending traditional executive education approaches through the integration of environmental exposure, stress regulation, and reflective learning. The programme translates theoretical constructs of resilience, conscious presence, and human-centred leadership into an observable and methodologically structured training format.

The training is designed as a progressive developmental process moving from immersion in uncertainty, through psychophysiological regulation, to responsible leadership action. This structure reflects empirically supported relationships between stress, perception, decision-making, and leadership behaviour in complex and dynamic systems. By situating learning within a real maritime context, DEEPWATER enables the emergence and analysis of authentic behavioural patterns that remain inaccessible in controlled classroom environments.

From an academic perspective, a key contribution of DEEPWATER Training lies in positioning inner stability as a core leadership competence in high-risk settings. Leadership effectiveness is shown to depend not solely on technical expertise or procedural compliance, but on the ability to remain present, ethically grounded, and responsive under pressure. The programme further demonstrates how experiential and environment-based learning can function as rigorous methodological tools rather than illustrative add-ons.

In conclusion, DEEPWATER Training constitutes a conceptually coherent and methodologically grounded applied framework aligned with the principles of human-centred leadership and Industry 5.0. It provides a solid foundation for future empirical research on leadership behaviour under stress and offers a replicable model for executive education in maritime and other high-risk operational domains.