

Leveraging the Iterative System Development Life Cycle Model for a Sustainable Seafarer Life Cycle Management

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Abstract: Individuals become seafarers for various reasons, often with projected timeframes from short to long-term. The Linear seafarer life cycle management model, from cadet to retirement, is a timeline often plagued by higher attrition due to a lack of career prospects, prolonged separation from family, and the physical and mental demands of maritime life. Notable in the Linear life cycle management model is the exit of experienced seafarers at the phase of retirement and transition. This is a waste of human capital, especially for the recruitment and retention phases, which have become much more challenging. This paper leverages the iterative model of the systems development life cycle to propose a strategic approach to navigating the talent seas through the circular seafarer life cycle management model. This framework is a model shift from the traditional linear Life Cycle Management of Seafarers to a regenerative and sustainable seafarers' life cycle. It harnesses the value created by one maritime entity to automatically benefit another maritime entity, and an improvement in one entity strengthens other components. This creates a virtuous cycle of continuous enhancement over time and a stable and resilient maritime. The framework also offers multiple entry and re-entry points for seafarers. This creates a continuous loop where skills and experiences of seafarers are harnessed, upcycled rather than lost to retirement or a switch in career.

Keywords: *Seafarer Life Cycle Management, Circular Economy, Sustainable Career, Maritime.*

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I. INTRODUCTION

Navigating the talent seas has become necessary in today's job market, especially with the rise in technology jobs that offer better pay packages than a career at sea. To harness the vast ocean of sea talents is an opportunity to re-imagine the lifecycle management of seafarers. If the talents of the sea are not managed strategically, it can lead to significant challenges for shipping companies and the delivery of essential commodities that have to be transported by sea. Life Cycle Management of Seafarers refers to the management of maritime personnel throughout all stages of their career journey. This cycle often begins with recruitment, training, deployment, and career transition or retirement. Figure 1 is a representation of these phases and activities of the different phases. It is the traditional approach to managing seafarer careers in a fixed and unidirectional progression that moves an individual from recruitment and training through active sea service, mid-career transition, and ultimately to retirement and permanent exit from the industry. This terminal nature of the life cycle model means that when a seafarer retires or transitions out of the industry, the wealth of professional knowledge,

expertise, and experience they have accumulated over a lifetime of maritime service is permanently lost rather than captured and redeployed for the benefit of the broader maritime ecosystem. This management model can be likened to the waterfall model of the system development life cycle (SDLC), which is a linear and sequential model. Each phase of the life cycle is independent of the other phase and must be fully completed before the next begins, and there is no mechanism for returning to a previous phase once it has been completed. It is a rigid and inflexible model.

This paper examines the shortfalls of the linear life cycle management of seafarers and proposes a seafarer life cycle management model from an SDLC perspective.

II. LITERATURE REVIEW

Individuals become seafarers for various reasons, often with projected timeframes from short to long-term. At recruitment, cadets often mention career transition as an option if retirement is not reached. The prospect of going ashore into another kind of marine industry or the possibility

of starting a different career ashore is a possibility often looked forward to. Reviews of career projections of seafarers reveal that less than 25% of new seafarers plan to remain at sea until retirement, while more than 75% plan to

come ashore within 15 years at sea. (Brooks and Greenberg, 2022). However, these expectations are often difficult to attain due to the linear life cycle management of seafarers.

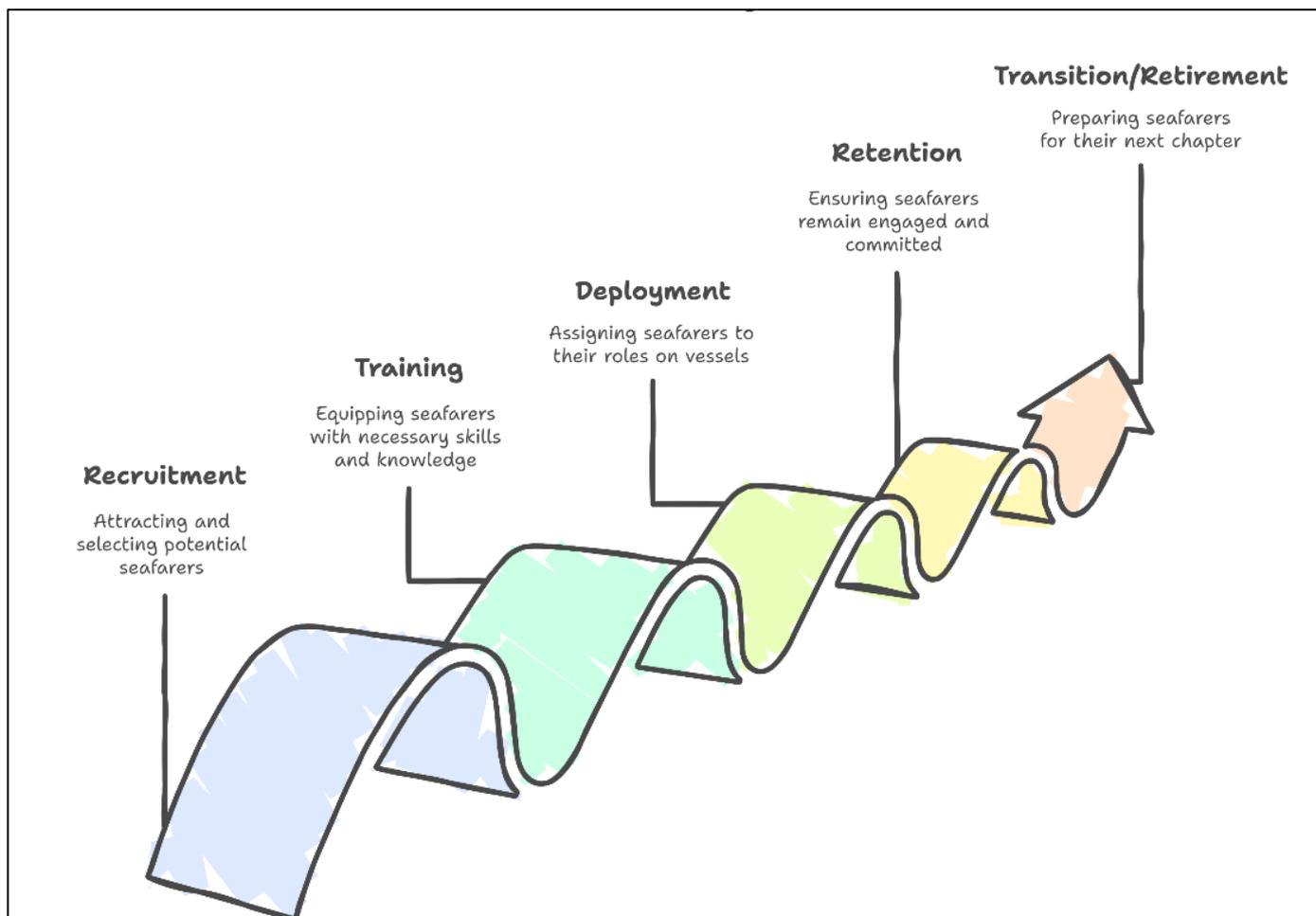


Fig 1. The Linear Life Cycle Management Model of Seafarers

The road for seafarers transitioning ashore to continue their career can be daunting (Carrera-Arce, Bartusevičienė and Divari, 2022). After years of specialization at sea, it becomes difficult for seafarers who desire to go ashore to get a satisfying job. Without finding a fitting job ashore after years at sea, seafarers remain at sea and begin to experience increased attrition. The Linear seafarer life cycle management model, from cadet to retirement, is often plagued by higher attrition due to a lack of career prospects, prolonged separation from family, and the physical and mental demands of maritime life. Attrition has been identified as a key factor affecting seafarers’ retention; indicators of increased attrition manifest as experienced seafarers request extension of leave periods, reduced sea time contracts, or transition ashore or permanent switch in career. This leads to a significant drain of experienced marine personnel from the shipping industry, a global shortage of qualified seafaring personnel that threatens the sustainability of shipping operations. International Transport Workers’ Federation (ITF) records that Nigeria accounts for 8% of global seafarers (Egole, 2024). Indicating a small

number of Nigerian seafarers for the shipping business in Nigeria.

The biggest disadvantage of the Linear life cycle management model is the exit of experienced seafarers at the phase of retirement and transition. This is a waste of human capital, especially for the recruitment and retention phases. Recruiting and retaining seafarers is much more challenging than ever before (IMarEST, 2023). Available seafarers for deployment on vessels are lagging behind their demand. This imbalance puts workers and vessels at risk and the organization at a loss. According to the 2023 Retention Report from Work Institute, the cost of every resignation is around 33% of the outgoing employee’s base salary. Employee turnover places work and extended sea time burden on remaining seafarers, potentially damaging engagement and morale. (Powell, 2024). According to a Seafarer Workforce Report from BIMCO and the International Chamber of Shipping, the marine industry must significantly increase training and recruitment levels if it is to avoid a serious shortage in the total supply of officers by 2026. (BIMCO/ICS, 2021) Retaining experienced

seafarers within the marine ecosystem offers numerous organisational benefits. They fill the shortage and rarity gap of qualified seafarers in the market, contributing to the competitive advantage of shipping firms. Retaining experienced seafarers offers a shipping organization a pool of competent and motivated seafarers, which can strengthen productivity for the organization and possibly reduce absenteeism and attrition.

A framework that retains seafarers within the marine ecosystem and within an organization will possess valuable knowledge and experience within the organization. This valuable knowledge pool, which is acquired through learning and experience, can be subsequently transferred to new seafarers and the management of shipping activities ashore (Yuen et al., 2018). By retaining experienced seafarers, shipping organizations can minimize the expensive and time-consuming process of constant recruitment. Navigating the sea of priced seafarers will involve remodelling the life cycle management to keep seafarers within the marine ecosystem, especially at the phase of retirement and transition.

III. THE CIRCULAR SEAFARER LIFE CYCLE MANAGEMENT MODEL

This paper presents an iterative approach to navigating the talent seas through circular seafarers' life-cycle management. Leveraging on the Iterative Model of SDLC, which involves developing a system through repeated cycles or iterations, where each iteration produces a working version of the system that is progressively refined and improved based on feedback, the circular seafarers' life-cycle management model shifts from the traditional linear Life Cycle Management of Seafarers to a sustainable and regenerative seafarers' life cycle. This model draws from the iterative SDLC Model and circular economy with sustainable development goals to create a self-reinforcing maritime ecosystem. A sustainable career for a seafarer implies health, happiness, and productivity (Yang, Chiu, and Lin, 2025). "A circular economy is a regenerative system in which materials and resources retain their value and utility for as long as possible, and waste and resource usage are minimized. It involves the extraction of materials, production, use, and regeneration, aiming to keep products, components, and materials at their highest value and utility at every stage of their lifecycle" (Ellen MacArthur Foundation, 2015). The proposed framework leans on these principles because circularity has become pivotal to sustainable resource management and business operations

(Basile, Petacca and Vona, 2024). A regenerative maritime ecosystem is a system of interconnected. Entities within the broader maritime ecosystem are strengthened by other entities through a positive feedback loop. This means that the value created by one maritime entity automatically benefits another maritime entity, and an improvement in one entity strengthens other components. This creates a virtuous cycle of continuous enhancement over time and a stable and resilient maritime. This framework maximizes human capital value and ensures the finest use of the talents of the seas while supporting seafarer wellbeing and sustainable career progression within the maritime industry.

The Circular Seafarer Life Cycle Model is an enhancement to the linear model. It retains the five phases of the linear model, albeit having interconnected feedback loops within phases and with different entry and re-entry points for seafarers. As seen in Figure 2, there is a cycle of inputs into one phase stemming from output from another phase. This circularity aims to sustainably utilize seafarers through reuse and repurposing, thereby minimizing talent waste and maximizing value. Although this model provides different entry and re-entry points for seafarers, the life cycle begins with the retirement and transition phase. This is a departure from the linear model that begins with the recruitment phase. Beginning with the retirement and transition phase ensures that experienced seafarers are injected into the system ashore. They are given priority for ashore job openings, training consultations, and mentoring opportunities before considering outsourcing. At retirement and transition phase, experienced seafarers re-enter the life cycle with industry diversification, experience, skill, and knowledge repository. These serve as inputs into the recruitment, training, deployment, and retention phases as indicated by the coloured arrows in Figure 2. Benefiting from the input and insights from the retirement phase, the recruitment phase outputs are recruits whose value matches the sustainable maritime goal. They are then trained, leaning on a wealth of knowledge from experienced seafarers, the output of the training phase is inspired and knowledgeable seafarers ready for input into the deployment phase. An output of the deployment phase is operational experience, innovative and experienced seafarers ready to coach others, hence they are valued enough and serve as input into the retention phase. The output of the retention phase into the retirement and transition phase are industry transformation, knowledge asset, and leadership pipeline. The outputs of each phase are talents that are expensive and too valuable to be lost in the sea of retirement and transition.

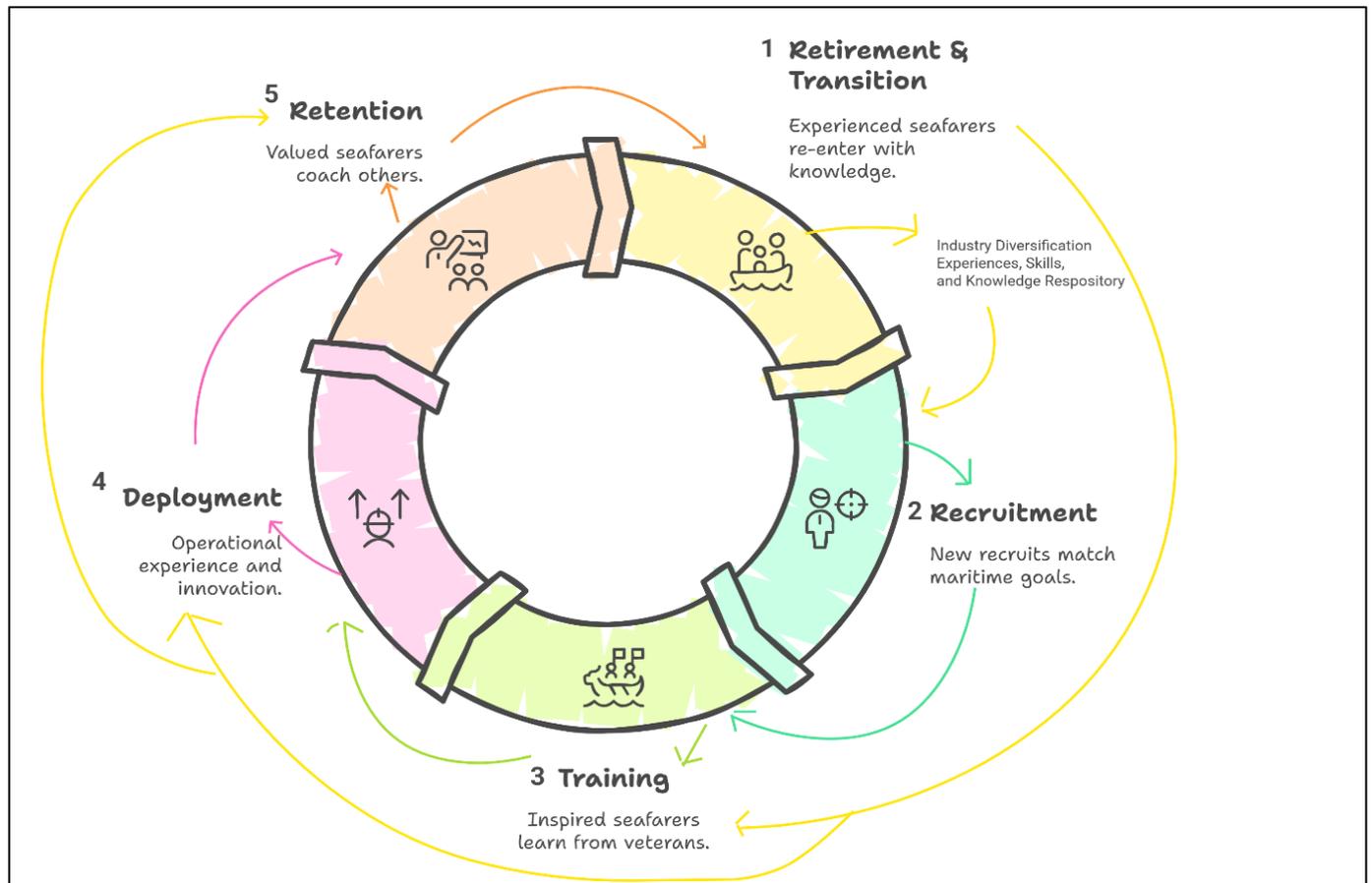


Fig 2. A Regenerative Circular Life Cycle Management Model of Seafarers.

Source: Author’s own

IV. DISCUSSION

A circular approach to the life cycle management of seafarers creates a sustainable life cycle management for seafarers where no seafarer’s talent, skill, and experience is wasted. Just as an iterative SDLC continuously refines and builds upon previous versions of a system, the circular seafarer framework continuously harnesses, upcycles, and reintegrates the skills, knowledge, and experience of seafarers rather than allowing them to be lost to retirement or career transition. Experienced seafarers can cycle back into consultancy and training roles, mentorship positions, or shore-based maritime careers, and also return to sea, if they choose to, with innovative perspectives. Seafarer’s expertise should be repurposed for maritime logistics, port management, or autonomous vessel oversight, training, or consulting. Retiring seafarers become knowledge banks and channels rather than endpoints. Their experience feeds back into the life cycle management system through mentorship programs, academic instruction, and policy development. This creates a continuous loop where expertise is retained.

V. CONCLUSION

A circular approach to the life cycle management of seafarers creates multiple entry and re-entry points. This creates a continuous loop where skills and experiences of seafarers are harnessed, upcycled rather than lost to retirement or a switch in career. This life cycle management

model meets the sustainable development goal of decent work for all seafarers, particularly in social protection, and opportunities for career advancement. In the event of injury, burnout, or industry changes, seafarers are profiled for transition opportunities rather than career endings.

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