# SKILLSFUTURE JOBS-SKILLS INSIGHTS

## DIGITAL SKILLS IN THE MARITIME INDUSTRY

SKILLS *future* SG

This Jobs-Skills Insights article is also published by the NUS Centre for Maritime Studies (CMS) MAritime Digital Efficiency (MADE) Online Magazine.

# Digital Skills in the Maritime Industry

In an era where data permeates every industry, its transformative influence on the maritime sector is both profound and undeniable. As the maritime industry—one of the oldest industries in global trade history—navigates the digital epoch, data acts as a catalyst for innovation and efficiency improvements. With the deepening of digitisation comes an imperative need for comprehensive cybersecurity strategies to counter emerging threats. The digital evolution is set to redefine maritime employment dynamics, fostering demand for new roles and reshaping traditional responsibilities.

## Trend 1 - The Advent of Big Data Analytics

Big data analytics offers a wealth of potential for maritime innovation. Think of it as an advanced navigational tool, helping optimise vessel routes by analysing real-time data on weather and maritime traffic. Such optimisation not only reduces fuel consumption and operational costs but also contributes to reducing carbon emissions—an environmental boon.

### A. Fuel Efficiency and Route Optimisation

Harnessing big data for route optimisation enables companies to significantly decrease fuel consumption. For instance, Royal Caribbean reportedly achieves annual savings of $12 million from these technologies. The integration of predictive analytics into route planning leads to sustainability and cost-effectiveness [1].

### B. Advancements in Predictive Maintenance

Predictive maintenance exploits big data to monitor vessel performance, identifying potential failures before they occur. This proactive approach can slash repair costs and downtime by up to 10%, ensuring operational continuity and safety [2].

### C. Reinforcing Safety Protocols

Big data analytics also fortifies safety protocols within maritime operations. By providing real-time operational intelligence, these technologies assist companies in navigating adverse conditions with greater precision. Notably, the number of maritime professionals with

data-related skills increased by 36% from 2023 to 2024, reflecting the growing emphasis on data fluency in industry safety [3].

## Trend 2 - The Cybersecurity Imperative in the Maritime Industry

With the acceleration of maritime digitalisation, cybersecurity has transitioned from a secondary consideration to a fundamental necessity. Modern maritime operations depend heavily on interconnected systems for navigation, cargo handling, and communication, which, despite their advantages, expose the industry to sophisticated cyber threats.

### A. Navigating Maritime Cybersecurity Challenges

Maritime cybersecurity faces distinct challenges—ranging from the complex integration of systems to the logistical difficulties of securing mobile vessels. The absence of standard protocols further complicates efforts to develop comprehensive defence strategies [4].

### B. The Escalation of Cyber Threats

As cyber threats grow both in number and sophistication, the industry must adopt advanced strategies to counter them effectively. Proactive measures and vigilance are critical in safeguarding maritime operations [5].

### C. Meeting Compliance and Regulatory Needs

Navigating the intricate web of compliance with cybersecurity regulations presents a formidable challenge. Enterprises need to allocate sufficient resources and expertise to ensure adherence to these regulations.
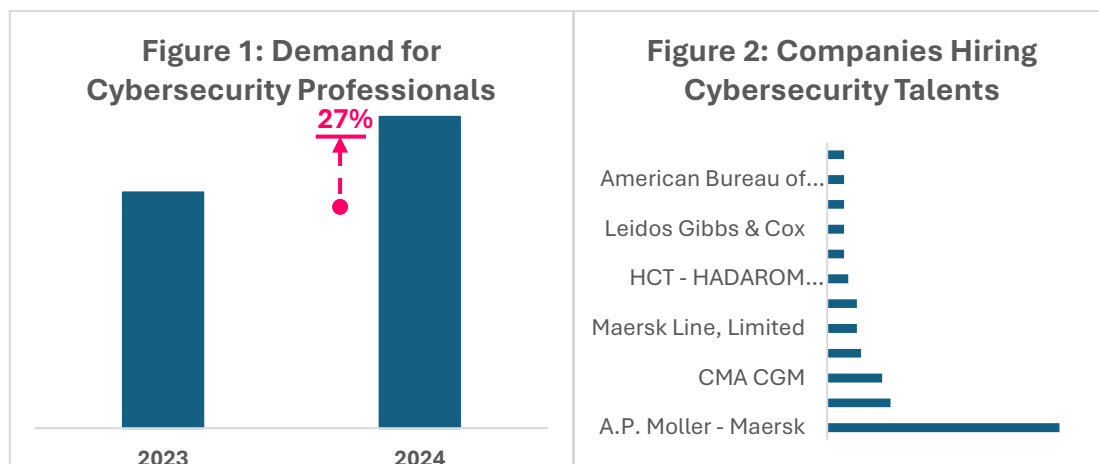
### D. Human Error and the Need for Training

A significant portion of cybersecurity breaches stem from human error, as evidenced in tactics like phishing. To mitigate such risks, maritime organisations must prioritise extensive training programs aimed at enhancing cyber-risk awareness and equipping personnel with critical threat detection and response capabilities [6].

## Emerging Need for Digital Specialists in the Maritime Industry

As digital trends advance, they inevitably reshape the industry's occupational landscape, creating new roles and altering traditional ones.

### A. Maritime Cybersecurity Specialist

The demand for experts who can safeguard vessels and infrastructure from digital threats is on the rise. From 2023 to 2024, the global employment of cybersecurity specialists in the maritime sector increased by 27%, highlighting the sector's commitment to prioritising digital security.



**Figure 1: Demand for Cybersecurity Professionals**

27%

2023    2024

**Figure 2: Companies Hiring Cybersecurity Talents**

American Bureau of...
Leidos Gibbs & Cox
HCT - HADAROM...
Maersk Line, Limited
CMA CGM
A.P. Moller - Maersk

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Overall Industry Expansion**: The total number of professionals in cybersecurity roles in the maritime sector globally has grown grow by 27% from 2023 to 2024, reflecting the industry's increasing focus on digital security and the criticality of robust cybersecurity frameworks.

**Significant Growth in Demand**: More specifically, the growth stems from hiring of management-level roles such as directors of cybersecurity. This is a signal that maritime companies are taking cyber threats seriously, putting in place the necessary infrastructure to tackle these threats. Between 2023 and 2024, global demand for top roles such as 'Head of cybersecurity' and 'Director of cybersecurity' in the maritime industry has surged by 24% and 10%, respectively.
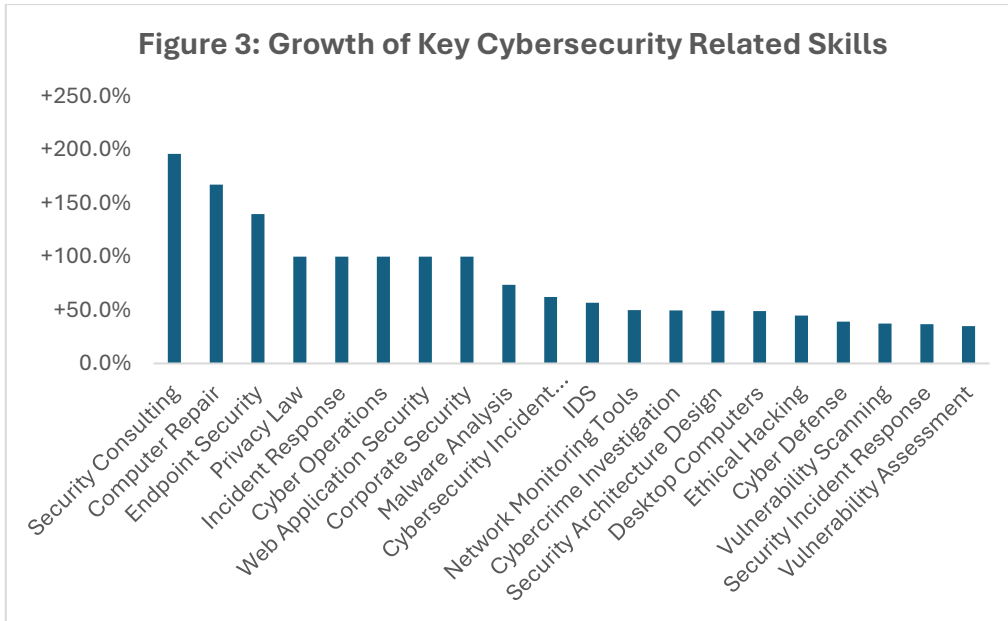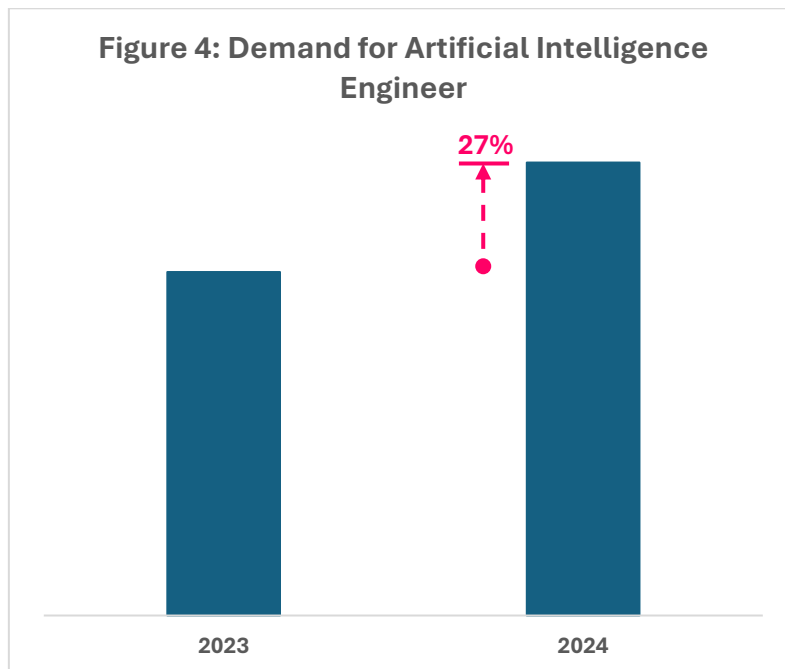
**Figure 3: Growth of Key Cybersecurity Related Skills**

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Explosive Demand for Key Skills**: Maritime security, cyber defence, and vulnerability research skills have seen demand skyrocket, with increases exceeding 100% across the sector, underscoring the critical need for expertise in these areas.

## B. Maritime AI Engineer

AI engineers are becoming indispensable as data analytics transform the maritime industry by optimising routes, improving fuel efficiency, and enhancing safety. We are no longer at the stage of simply analysing data; businesses are incorporating them into operational pipelines and systems.
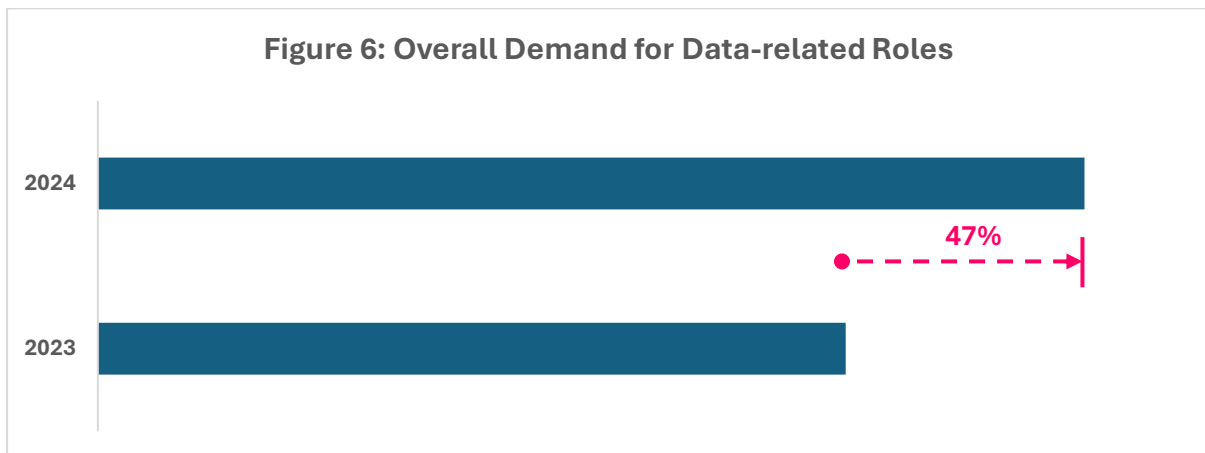
**Figure 4: Demand for Artificial Intelligence Engineer**

27%

2023          2024

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**27% Increase in AI Demand**: Between 2023 and 2024, the number of AI engineers required in the maritime industry increased by 27%, reflecting the growing importance of incorporating AI into operational pipelines.
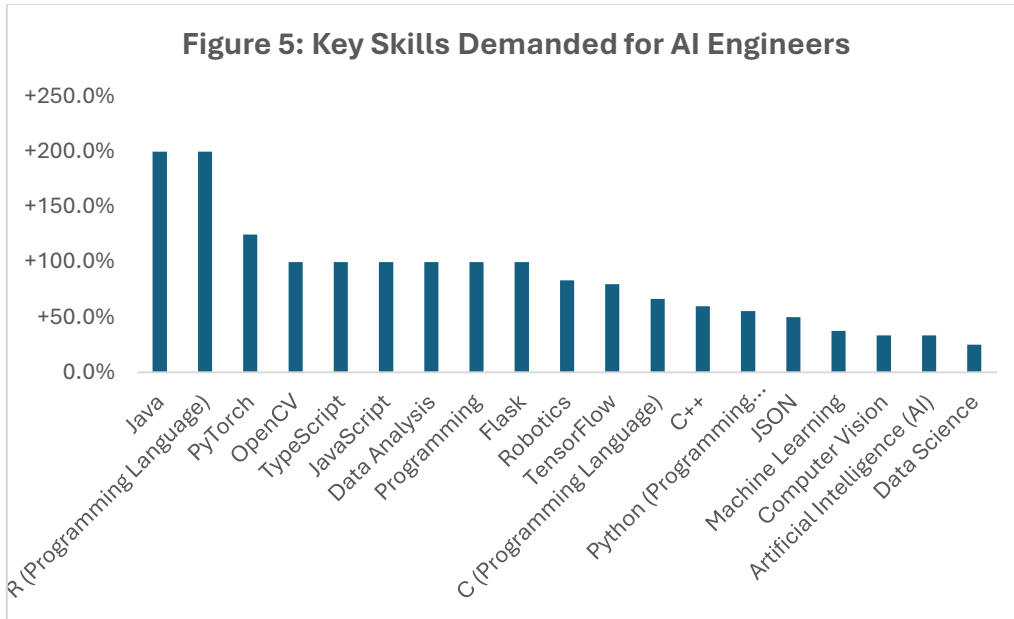
**Figure 5: Key Skills Demanded for AI Engineers**

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Key Skills in High Demand**: Skills such as Java, PyTorch, TypeScript, and Data Analysis have seen demand more than double, reflecting the industry's focus on transforming data into actionable insights.



**Figure 6: Overall Demand for Data-related Roles**

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Increasing Digital Skills Adoption by Maritime Professionals**: Beyond just AI engineers, when comparing Singapore's maritime industry against our regional[1] counterparts, the number of professionals[2] working on data-related roles in the maritime sector has risen by 47%, showcasing the

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1 Regional counterparts refer to South-East Asian countries.

2 List of Job titles experiencing high growth comprise software engineer, data analyst, data engineer, business analyst, data scientist, AI specialist

growing importance of data in decision-making locally. This is a testament that the maritime industry is no longer just making data-driven insights, they are incorporating data into operations, building products that are backed by data to support their operational pipeline.

## Evolution of Established Roles

Traditional maritime roles are evolving in response to new digital imperatives.

### A. Marine Engineer

Marine engineers are evolving in response to digital trends in the sector. Increasingly, they are expected not only to manage the mechanical aspects, but also to be able to harness data insights to enhance engineering planning and optimisation.

Marine engineers are using predictive maintenance techniques to monitor equipment health and efficiency, reducing downtime and operational costs. They must ensure that shipboard systems are secure from cyber-attacks, particularly those that control critical components like engine management and automated systems.



**Figure 7: Demand for Marine Engineer with Data-Related Skills**
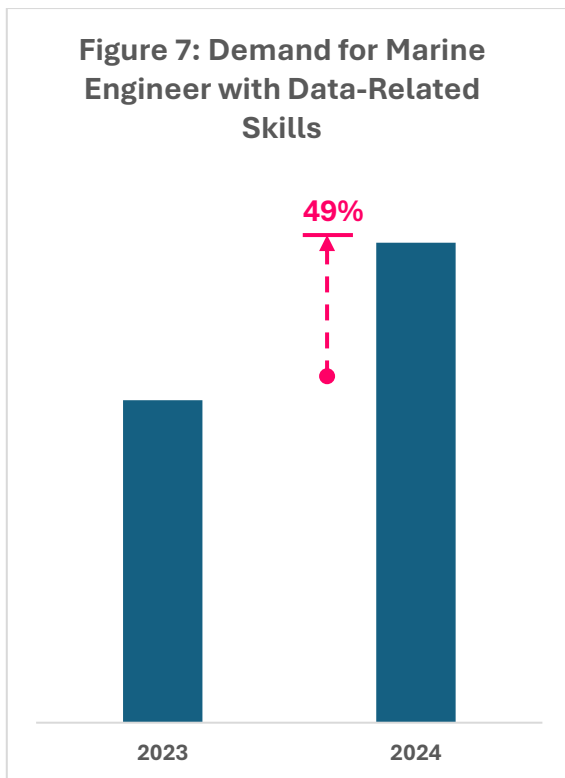
| Examples of Data-Related Skills |
|---|
| Data Analysis |
| Statistical Data Analysis |
| Data Modelling |
| Data Warehousing |
| Big Data Analytics |
| Database Management |

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Demand Shift for Data Skills**: While overall hiring demand for marine engineers has remained steady from 2023 to 2024, there has been a notable 49% increase in demand for marine engineers with data analysis

expertise, reflecting the evolving role of engineers in integrating big data into maritime operations.

**Expanding Responsibilities**: Marine engineers are increasingly expected to not only manage the mechanical aspects of vessels but also harness data insights to enhance engineering planning and optimise ship operations.
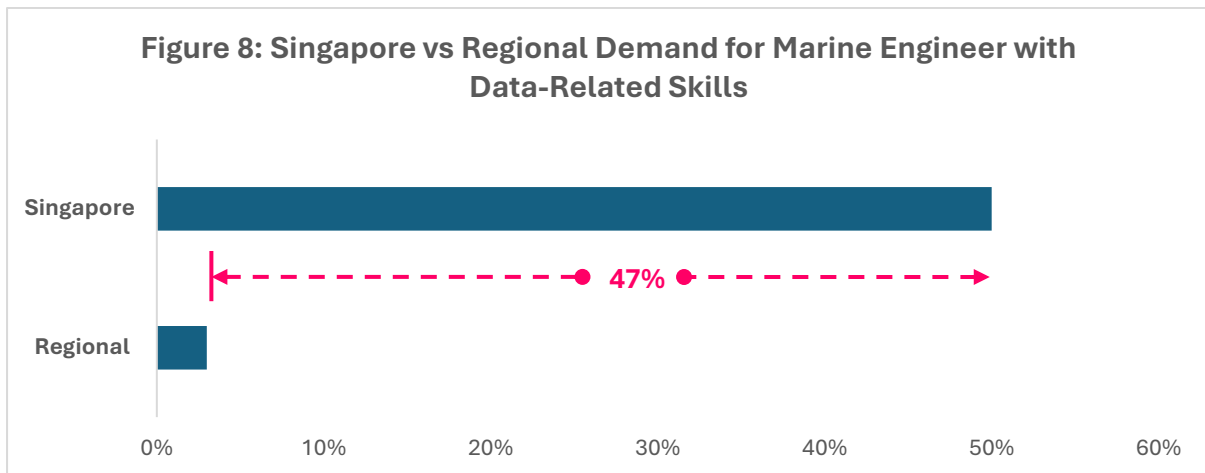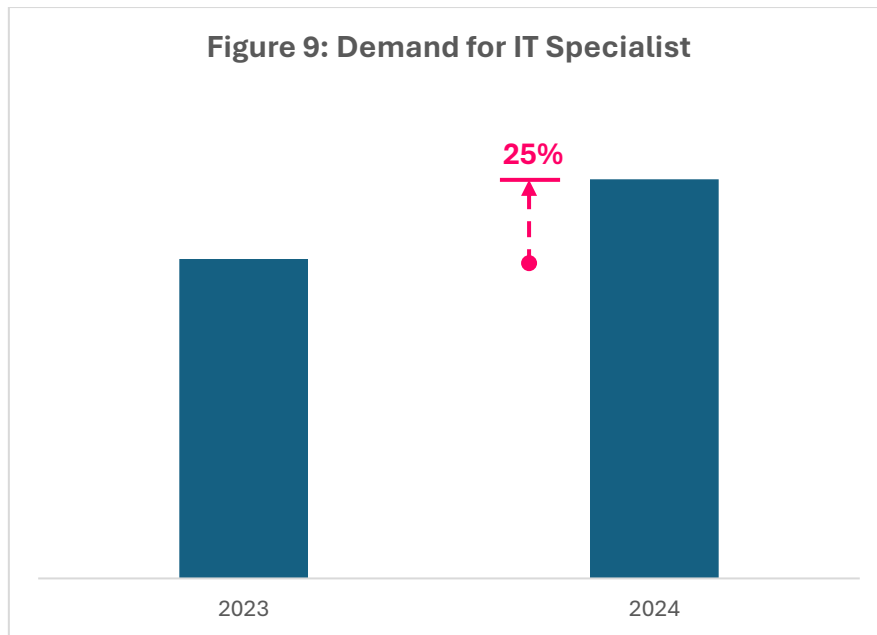


Figure 8: Singapore vs Regional Demand for Marine Engineer with Data-Related Skills

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Regional Demand Variance**: Globally, the demand for marine engineers is growing steadily at 3%. However, in Singapore, demand for marine engineers with data-related skills are growing exponentially at 47%[3]. This is testament that Singapore companies are becoming aware of the benefits of embedding data analytics into their engineering processes.

## B. Maritime IT Specialist

IT specialists are increasingly required to integrate and manage big data solutions, streaming real-time data from ship sensors, and providing analytical platforms for decision-making. They are on the front lines of implementing and maintaining cybersecurity measures, from firewalls and encryption to user access controls and incident response protocols.

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3 Absolute numbers in the hundreds, based on a generic search for marine engineers in Singapore.

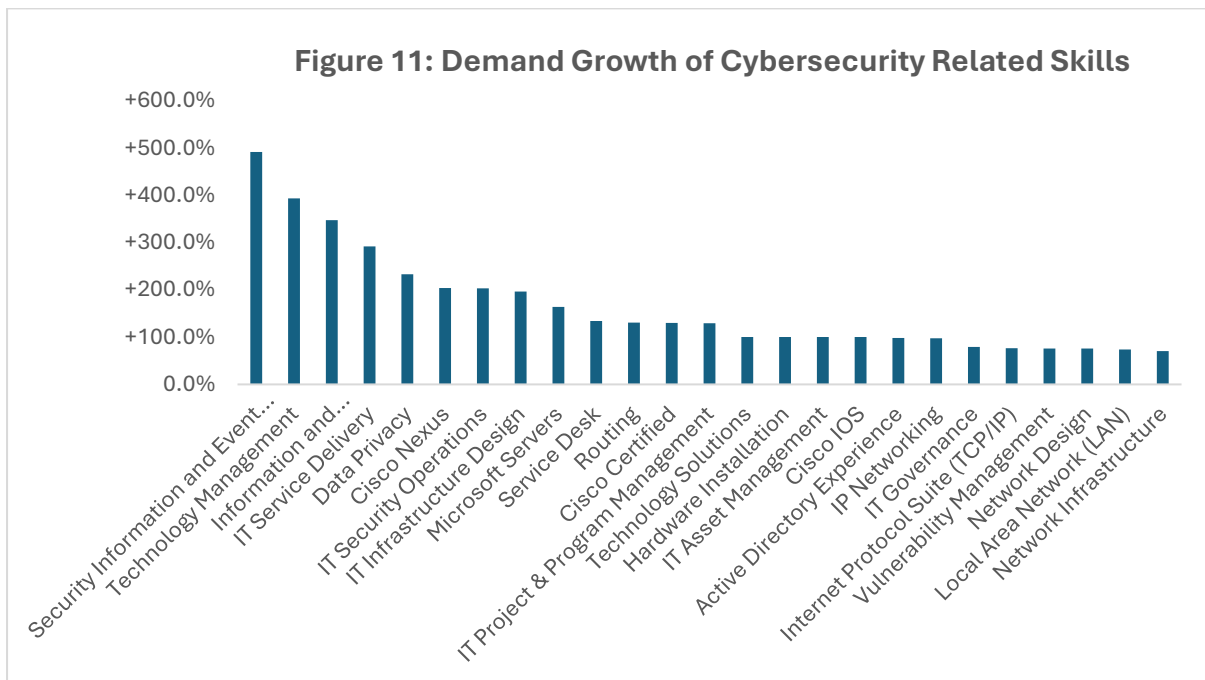**Figure 9: Demand for IT Specialist**

25%

2023    2024

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Rising Demand for IT Talent**: From 2023 to 2024, the hiring demand for IT specialists in the maritime industry increased by approximately 25%. On top of this, IT specialists increasingly need to be equipped with cybersecurity-related skills, with twice as many of them having these skills in 2024 compared to 2023. Akin to marine engineers, it is reflective of the ongoing digital trends with the growing importance of cybersecurity.
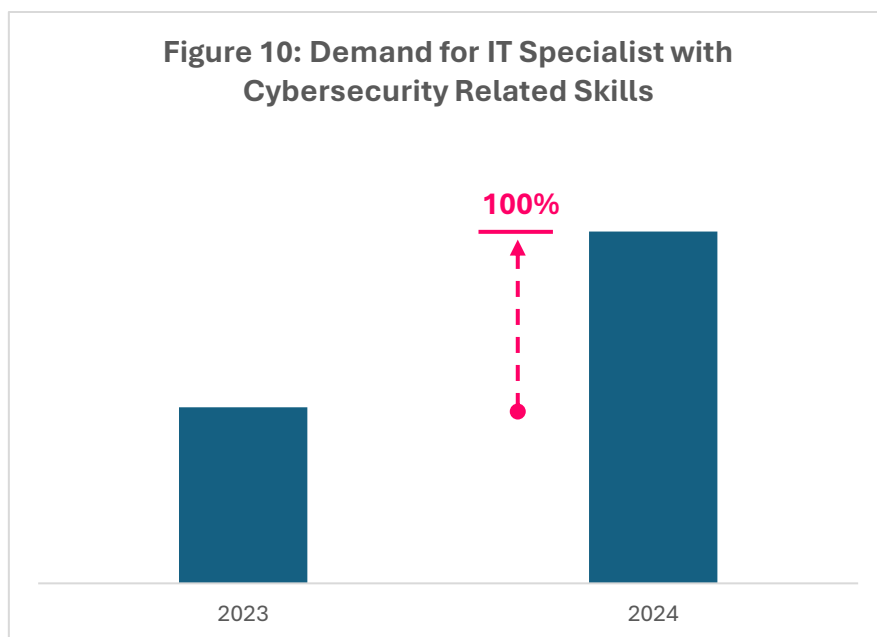


**Figure 10: Demand for IT Specialist with Cybersecurity Related Skills**

100%

2023    2024

[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Global and Local Trends**: Both globally and locally, there is a significant rise in demand for IT specialists with cybersecurity skills, underscoring a global shift towards integrating comprehensive cybersecurity measures into maritime systems. Notably, there is a surge in demand, over 100%, for IT specialists equipped with cybersecurity expertise.



[Analysis by SkillsFuture Singapore, leveraging data from LinkedIn Talent insights (dated Aug 2024).]

**Heightened Awareness**: As companies become increasingly aware of the critical importance of data protection, the emphasis on incorporating robust cybersecurity frameworks has grown substantially, along with skills related to cybersecurity, such as security information, technology management, data privacy. Most of the skills are experiencing more than 100% growth with some even reaching 500%.

## Conclusion

The maritime industry's digital transformation ushers in both opportunities and challenges. As maritime enterprises innovate and protect their operations, the workforce must adapt by sharpening digital competencies to maintain industry competitiveness. People remain the sector's most vital asset; equipped with the right skills, they can seize new opportunities and confront challenges. It is essential to embrace these digital competencies to effectively navigate the industry's ongoing evolution.

## Acknowledgements

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