STEER

Seafarer Technology Engagement
Empowerment and Resilience

#ListeningToSeafarers

The evidence, the gaps and the way forward

Appendix 2

Academic Papers Related to the Impact of Technology on Seafarers

The Nautical Institute

In collaboration with LR Foundation

Appendix 2

Academic papers related to the impact of technology on seafarers

N	Author(s)	Year	Title	Published in
1	Aalberg, A. L., & Kongsvik, T.	2026	How can maritime automation and autonomy be safely implemented? A mixed-method topic model	WMU Journal of Maritime Affairs
2	Aalberg, A.L.	2024	Pride and mistrust? The association between maritime bridge crew officers' professional commitment and trust in autonomy	WMU Journal of Maritime Affairs, 23
3	Aalberg, A.L.	2024	Seamanship in the age of automation: Reduced practical wisdom? Observations from fieldwork on automated car ferries in Norway	Public Anthropologist, 6(2)
4	Abila S., Kitada M., Malecosio S., Tang L., & Espina-Subong, R.	2023	Empowering seafarers as agents of their mental health: The role of ICT in seafarers' well-being	The Journal of Health Care Organization, Provision, and Financing, 60
5	Allen, P.	2009	Perceptions of technology at sea amongst British seafaring officers	Ergonomics, 52(10)
6	Aylward, K., Weber, R., Man, Y., Lundh, M., & MacKinnon, S. N.	2020	"Are you planning to follow your route?" The effect of route exchange on decision making, trust, and safety	Journal of Marine Science and Engineering, 8(4)
7	Baum-Talmor, P., & Kitada, M.	2022	Industry 4.0 in shipping: Implications to seafarers' skills and training	Transportation Research Interdisciplinary Perspectives, 13
8	Bayrak, D., & Muslu, A.	2025	The impact of digitalization on the maritime sector: Analyzing technostress among officer seafarers	International Maritime Safety, Environmental Affairs, and Shipping, 9(2)
9	Bayrak, D., & Muslu, A.	2025	Technostress management for seafarers in the Maritime 4.0 era	Australian Journal of Maritime & Ocean Affairs, 18(1)
10	Bielic, T., & Zec, D.	2004	Influence of ship technology and work organization on fatigue	Pomorski zbornik, 42
11	Bogusławski, K., Gil, M., Nasur, J., & Wrobel, K.	2022	Implications of autonomous shipping for maritime education and training: the cadets perspective	Maritime Economics & Logistics, 24
12	Bram, S., Costa, N., Fabricius, V., Sjöblom, T., & Nilsson, E.	2025	Reframing procedures and teamwork for man overboard (MOB) scenarios on small MASS passenger ferries	16th International Conference on Applied Human Factors and Ergonomics
13	Brandsæter, A., Georg Smefjell, G., van de Merwe, K., & Kamsvåg, V.	2020	Assuring safe implementation of decision support functionality based on data-driven methods for ship navigation	The 30th European Safety and Reliability Conference
14	Ceylan, B. O., Akyuz, E., & Arslan, O.	2021	Systems-theoretic accident model and processes (STAMP) approach to analyse socio-technical systems of ship allision in narrow waters	Ocean Engineering, 239

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15	Chan, J. P., Norman, R., Pazouki, K., & Golightly, D.	2022	Autonomous maritime operations and the influence of situational awareness within maritime navigation	WMU Journal of Maritime Affairs, 21
16	Chan, J.P., Pazouki, K., & Norman, R. A.	2022	An experimental study into the fault recognition of onboard systems by navigational officers	Journal of Marine Engineering & Technology, 22(2)
17	Chan, J. P., Pazouki, K., Norman, R., & Golightly, D.	2025	Investigating the impact of seafarer training in the autonomous shipping era	Journal of Marine Science and Engineering, 13(4)
18	Chowdhury, M.N., Shafi, S., Arzaman, A.F.M., Teoh, B.A., Kadhim, K.A., Salamun, H., Abdul Kadir, F.K., Said, S., Abd Kadir, K., Embong, A.M., Abdul Aziz, N.A., Jusoh, M.H., Pham, L.H.H., & Xuan, A.N.S.	2024	Navigating human factors in maritime safety: A review of risks and improvements in engine rooms of ocean-going vessels	International Journal of Safety and Security Engineering, 14(1)
19	Cummings, M. L., Buchin, M., Carrigan, G., & Donmez, B.	2010	Supporting intelligent and trustworthy maritime path planning decisions	International Journal of Human-Computer Studies, 68(10)
20	Dachev, Y., & Lazarov, I.	2019	Impact of the marine environment on the health and efficiency of seafarers	WSEAS Transactions on Business and Economics,16
21	Dachev, Y., & Panov, A.	2017	Traditional navigation in e-navigation context	18th Annual General Assembly, International Association of Maritime Universities
22	de Rosa, F., & Jousselme, A.L.	2019	Towards a coherent assessment of situational awareness to support system design in the maritime context	Ahram, T. (eds) Advances in Artificial Intelligence, Software and Systems Engineering. AHFE 2019. Advances in Intelligent Systems and Computing, 965
23	Dominguez-Péry, C., & Vuddaraju, L.N.R.	2020	From human automation interactions to social human autonomy machine teaming in maritime transportation	Sharma, S.K., Dwivedi, Y.K., Metri, B., Rana, N.P. (eds) Re-imagining Diffusion and Adoption of Information Technology and Systems: A Continuing Conversation. TDIT 2020. IFIP Advances in Information and Communication Technology
24	Emad, G.R., & Ghosh, S.	2023	Identifying essential skills and competencies towards building a training framework for future operators of autonomous ships: a qualitative study	WMU Journal of Maritime Affairs, 22

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25	Emad, G.R., Enshaei, H., & Ghosh, S.	2021	Identifying seafarer training needs for operating future autonomous ships: a systematic literature review	Australian Journal of Maritime & Ocean Affairs, 14(2)
26	Fan, S., & Yang, Z.	2023	Analysing seafarer competencies in a dynamic human-machine system	Ocean & Coastal Management, 240
27	Gauss, B., & Rotting, M.	2007	Supporting situational risk awareness in ship navigation	IFAC Proceedings Volumes 40(16)
28	Gkerekos, C., Theotokatos, G., Bujorianu, L. M., Boulougouris, E., Vassalos, D., Carballedo, B., McCluskey, S., Coats, T., & Sloan, R.	2019	Digitalisation in the UK maritime sector: A stakeholders' pulse check	International Conference on Marine Industry 4.0.
29	Goedicke, D., Li, S., Degraen, D., John, K., Sugiura, Y., Min, T., Kim, H., Kwak, S., Savage, V., Igoe, T., Sirkin, D., Ju, W., & Schneegass, S.	2025	Bring your own interface: Exploring tactile interaction in maritime automation	Companion Publication of the 2025 ACM Designing Interactive Systems Conference
30	Grech, M., Drohan, D., Warren, R., & Gamble, G.I.	2012	Ship recoverability: How important is the human factors input?	Royal Institution of Naval Architects International Maritime Conference
31	Hahn, A., & Lüdtke, A.	2013	Risk assessment of human machine interaction for control and e-navigation systems of marine vessels	IFAC Proceedings Volumes, 46(33)
32	Han, C., Islam, R., Abeysiriwardhane, A., & Chai, S.	2024	Advancing maritime technology: Evaluating situation awareness support systems for engine room monitoring at the future shore control centre	Journal of International Maritime Safety, Environmental Affairs, and Shipping, 8(3)
33	Han, S., Li, F., Lee, C.-H., Wang, T., & Diaconeasa, M.A.	2024	Mirror the mind of crew: Maritime risk analysis with explicit cognitive processes in a human digital twin	Advanced Engineering Informatics, 62(B)
34	Hannaford, E., & Hassel, E.V.	2021	Risks and benefits of crew reduction and/or removal with increased automation on the ship operator: A licensed deck officers perspective	Applied Sciences, 11(8)
35	Hickethier, A. F. & Yang, C. C.	2023	An analysis of causes related to human factors in maritime accidents	International Journal of Marine Engineering, 165(2)
36	Hogenboom, S., Rokseth, B., Vinnem, J.E., & Utne Bouwer, I.	2020	Human reliability and the impact of control function allocation in the design of dynamic positioning systems	Reliability Engineering & System Safety, 194
37	Hynnekleiv, A., Lützhöft, M., & Earthy, J. V.	2019	Siri, sail the ship!-Exploring human-RIA relationships in the maritime domain	Proceedings of Ergoship
38	Ibrahim, A.M.	2024	The impact of voluntary artificial intelligent self-driven education and training platforms on maritime security personnel: ISPS code	Journal of Transportation Security, 17
39	Jensen, R.B.	2021	Fragmented digital connectivity and security at sea	Marine Policy, 130

N	Author(s)	Year	Title	Published in
40	Karnavas, S.I., Peteinatos, I., Kyriazis, A., & Barbounaki, S.G.	2025	Using fuzzy multi-criteria decision-making as a human-centered AI approach to adopting new technologies in maritime education in Greece	Information, 16(4)
41	Kitada et al.	2019	Command of vessels in the era of digitalization	Kantola, J.I., Nazir, S., Barath, T. (eds) Advances in Human Factors, Business Management and Society. AHFE 2018. Advances in Intelligent Systems and Computing
42	Kitada, M., & Baum-Talmor, P.	2019	Maritime digitisation and its impact on seafarers' employment from a career perspective	Proceedings of the International Association of Maritime Universities (IAMU) Conference
43	Klostermann, M., Brandhorst, S., & Kluge, A.	2020	What the maritime industry can learn from safety training in the process industry and why non-technical skills are indispensable for mariners in critical situations	Nazir, S., Ahram, T., Karwowski, W. (eds) Advances in Human Factors in Training, Education, and Learning Sciences. AHFE 2020. Advances in Intelligent Systems and Computing, 1211
44	Lagdami, K.	2024	Technostress and the future of work at sea	International Conference on Human Factors in Design, Engineering, and Computing
45	Lagdami, K., & Ramadan, E.	2024	AI and big data at sea: Their potential impact on seafarers	International Maritime Transport Logistics Conference, 14
46	Lee, C., & Lee, S.	2024	A risk identification method for ensuring AI-integrated system safety for remotely controlled ships with onboard seafarers	Journal of Marine Science and Engineering, 12(10)
47	Li, X., Seah, R., Wang, X., & Yuen, K.F.	2022	Investigating the role of sociotechnical factors on seafarers psychological capital and mental well-being	Technology in Society, 71
48	Lundh, M., & Rydstedt, L.W.	2016	A static organization in a dynamic context - A qualitative study of changes in working conditions for Swedish engine officers	Applied Ergonomics, 55
49	Lundh, M., Palmen, C., Huffmeier, J., & MacKinnon, S.	2024	The impact of digitalization on maritime safety and the work environment of the crew	Academic Report
50	Lutzhoft, M., & Dekker, S.W.A.	2002	On your watch: Automation on the bridge	Journal of Navigation, 55(1)
51	Man, Y., Brorsson, E., & Björndal, P.	2023	Human-machine interaction challenges for bridge operations in large passenger ships and future improvements from the deck officers perspective	14th International Conference on Applied Human Factors and Ergonomics

N	Author(s)	Year	Title	Published in
52	Mišković D., Bielić T., & Čulin, J.	2018	Impact of technology on safety as viewed by ship operators	Transactions on Maritime Science, 7(1)
53	Mu, B., Guo, F.B., Yang, Z., & Jenkinson, I.	2023	Interface and interaction: The symbolic design for bridge conning system	14th International Conference on Applied Human Factors and Ergonomics
54	Müller-Plath G., Lehleitner J., Maier,J., Silva-Löbling, J., Zhang, H., Zhang, X., & Zhou, S.	2023	How does maritime situation awareness depend on navigation automation and mental workload? A sea simulator experiment	The International Journal on Marine Navigation and Safety of Sea Transportation, 17(4)
55	Muslu, A.	2021	The future of seafarers and the seafarers of the future from the perspective of human resources management	Turkmenoglu, M.A. & Cicek B. (eds) Contemporary Global Issues in Human Resource Management
56	Narayanan, S. C., Emad, G.R., & Fei, J.	2023	Theorizing seafarers' participation and learning in an evolving maritime workplace: an activity theory perspective	WMU Journal of Maritime Affairs, 22
57	Narayanan, S. C., Emad, G.R., & Fei, J.	2023	Key factors impacting women seafarers participation in the evolving workplace: A qualitative exploration	Marine Policy, 148
58	Nilsson, R., Gärling, T., & Lützhöft, M.	2009	An experimental simulation study of advanced decision support system for ship navigation	Transportation Research Part F: Traffic Psychology and Behaviour, 12(3)
59	Onyshchenko, S., Savelieva, I., Melnyk, O., Koryakin, K., & Kotenko, O.	2025	Enhancing safety and efficiency in maritime ergatic systems through advanced information technologies	Babak, V., Zaporozhets, A. (eds) Systems, Decision and Control in Energy VII. Studies in Systems, Decision and Control
60	Özsever, B., & Tavacioglu, L.	2022	Mental workload (MWL) measurement of officers in simulated ship navigation: Determining the readlines of performance	The International Journal of Maritime Engineering, 164(1)
61	Paik, J.-K.	2026	From the titanic era to the AI era: digital healthcare engineering as a lifecycle, real-time, intelligent, integrated management solution driven by AI, digital twin, and high-speed communication technologies	Ships and Offshore Structures, 21(1)
62	Pazouki, K., Forbes, N., Norman, R.A., & Woodward, M.D.	2018	Investigation on the impact of human-automation interaction in maritime operations	Ocean Engineering, 153
63	Petersen, E. S., Dittmann, K., & Lutzhoft, M.	2010	Making the phantom real: A case of applied maritime human factors	International Symposium On Ship Operations, Management and Economics
64	Porathe, T., & Lützhöft, M.	2018	A harmonized display of e-navigation information; Workload and navigational control; Contextual control levels	RINA Conference on Human Factor

N	Author(s)	Year	Title	Published in
65	Praetorius, G., Kataria, A., Petersen, E.S., Schröder-Hinrichs, J.-U., Baldauf, M., & Kähler, N.	2015	Increased awareness for maritime human factors through e-learning in crew-centered design	Procedia Manufacturing,3
66	Psarros, G.A.	2018	Fuzzy logic system interference in ship accidents	Human Factors and Ergonomic in Manufacturing & Service Industries, 28
67	Qiao, R., & Fan, S.	2026	Human-machine interaction for maritime transport using a data-driven approach	Reliability Engineering & System Safety, 267(B)
68	Rumawas, V., & Asbjørnslett, B.E.	2016	Human factors in ship design and operation: A preliminary survey of the theoretical construct	The International Journal of Maritime Engineering, 158
69	Rumawas, V., & Asbjørnslett, B.E.	2016	Human factors on offshore supply vessels in the Norwegian Sea: An exploratory survey	The International Journal of Maritime Engineering, 158
70	Rumawas, V., & Asbjørnslett, B.E.	2012	Offshore supply vessel design and operation: A human factors exploration	Grall, B., & Soares, G. (eds) Advances in Safety, Reliability and Risk Management
71	Russo, A., Popović, T., & Tomić, V.	2014	The impact of technology on seafarer's work and leisure	6th International Maritime Science Conference
72	Sakidin, S., Chew, B. C., Hamid, S. R., & Subramaniam, M.	2018	Assessing the usage of technology on the bridge of merchant ships	Journal of Computational and Theoretical Nanoscience, 24(5)
73	Shahbakhsh, M., Emad, G.R., & Cahoon, S.	2021	Industrial revolutions and transition of the maritime industry: The case of Seafarer's role in autonomous shipping	The Asian Journal of Shipping and Logistics, 38(1)
74	Söffker, D., Bejaoui, A., & Shyshova, O.	2025	Progress towards multidimensionally scalable assisted and/or automated ship navigation and control-part II: Human in the interaction loop	Journal of Marine Engineering & Technology, 24(4)
75	Suranta, N., Barasa, L., Malau, A.G., Simanjuntak, M., Napitupulu, P.V.A., & Utama, Y.P.	2025	Digitalization and sustainability in maritime management: Stakeholder perspectives on technology and vocational training	The 2nd International Seminar on Tropical Bioresources Advancement and Technology
76	Symes, S., Blanco-Davis, E., Fairclough, S., Yang, Z., Wang, J., & Shaw, E.	2025	An investigation of the effect of fatigue on ship engine room operators using fNIRS	Ocean Engineering, 327
77	Szłapczyński, R., Szłapczyńska, J., Gil, M., Życzkowski, M., & Montewka, J.	2024	Holistic collision avoidance decision support system for watchkeeping deck officers	Reliability Engineering & System Safety, 250
78	Taylor, N.C., Bekker, A., & Kruger, K.	2023	Mariner 4.0: integrating seafarers into a Maritime 4.0 environment	The International Journal of Maritime Engineering, 164

N	Author(s)	Year	Title	Published in
79	Thistle, R., Smith, J., & Veitch, B.	2025	User-centred analysis to inform the development of ice navigation decision support technologies	28th International Conference on Port and Ocean Engineering under Arctic Conditions
80	Tusher, H.M., Nazir, S., Mallam, S., Yang, Z., Asgher, U., & Rusli, R.R.	2024	Exploring the effects of automation malfunction on team communication and coordination in ships' engine rooms	Process, Safety, Progress, 43(1)
81	Tzannatos, E.	2002	GMDSS operability: The operator-equipment interface	Journal of Navigation, 55(1)
82	Utne, I.B., Schjølberg, I., & Roe, E.	2019	High reliability management and control operator risks in autonomous marine systems and operations	Ocean Engineering, 171
83	van de Merwe, F., Kähler, N., & Securius, P.	2016	Crew-centred design of ships – The CyClaDes Project	Transportation Research Procedia, 14
84	van de Merwe, K., & Veitch, E.	2024	Human oversight in ship autonomy	Kim, T.E., Sydnes, A.K., Batalden, B.-M., & Perera, L.P. (eds) Human Factors in Remote Ship Operations
85	van de Merwe, K., Mallam, S., Nazir, S., & Engelhardtsen, Ø.	2024	The influence of agent transparency and complexity on situation awareness, mental workload, and task performance	Journal of Cognitive Engineering and Decision Making, 18(2)
86	van de Merwe, K., Mallam, S., Nazir, S., & Engelhardtsen, Ø.	2024	Navigators' perspective on information requirements for supervisory control of autonomous ships	Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 68(1)
87	Vázquez Neira, M., Cao Feijóo, G., Sánchez Fernández, B., & Orosa, J.A.	2025	Deep learning for visual leading of ships: AI for human factor accident prevention	Applied Sciences, 15(15)
88	Veitch, E., Alsos, O.A., Cheng, T., Senderud, K., & Bouwer Utne, I.	2024	Human factor influences on supervisory control of remotely operated and autonomous vessels	Ocean Engineering, 299
89	Veitch, E., Christensen, K.A., Log, M., Valestrand, E.T., Lundheim, S.H., Nesse, M., Alsos, O.A., & Steinert, M.	2022	From captain to button-presser: Operators' perspectives on navigating highly automated ferries	Journal of Physics: Conference Series, 2311
90	Veitch, E., Dybvik, H., Steinert, M., & Alsos, O.A.	2024	Collaborative work with highly automated marine navigation systems	Computer Supported Cooperative Work, 33
91	Veltsin, N., Chountalas, P.T., Koutsouki, E., Karvounidi, M.D., & Fousteris, A.E.	2025	The human element in maritime industry safety: modeling the critical success factors	Safety Science, 189
92	Viktorelius, M.	2020	Saving energy at sea: Seafarers adoption, appropriation and enactment of technologies supporting energy efficiency	PhD dissertation, Chalmers University of Technology

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93	Vu, V.D., Lutzhoft, M., & Imset, M.	2022	Logical grouping of data and control functions on the displays of shipboard navigation systems	Journal of Navigation, 75(3)
94	Walter, M., Vineetha Harish, A., Christison, L., & Tam, K.	2025	Visualisation of cyber vulnerabilities in maritime human-autonomy teaming technology	WMU Journal of Maritime Affairs, 24
95	Wampler, J., Li, B., Moscicki, T., & von Ellenrieder, K.	2017	Towards adjustable autonomy for human-robot interaction in marine systems	OCEANS 2017
96	Wang, X., Zhao, G., Cao, L., Yu, J., Li, Y., Wang, H., & Cao, W.	2026	Structural causality hierarchy analysis: A novel data-driven integrated method for assessing occupational accidents in maritime transportation	Safety Science, 196
97	Wróbel, K., Formela, K., Kołakowski, P., & Gil, M.	2025	Time budget for merchant ship control takeover-preliminary results	International Journal on Marine Navigation and Safety of Sea Transportation, 19(3)
98	Yoshida, M., Shimizu, E., Sugomori, M., & Umeda, A.	2021	Identification of the relationship between maritime autonomous surface ships and the operator's mental workload	Applied Sciences, 11(5)
99	Zakariah, W. N. A., Ngah, A. H., Jeevan, J., Mohd Salleh, N. H., & Rahi, S.	2025	Fatigue on the beautiful Blue Ocean: the mediation effects of occupational stress and job performance in the job demands-resources theory	Australian Journal of Maritime & Ocean Affairs, 17(3)
100	Zhang, M., Zhang, D., Yao, H., & Zhang, K.	2020	A probabilistic model of human error assessment for autonomous cargo ships focusing on human-autonomy collaboration	Safety Science, 130
101	Zhang, R. L., & Furusho, M.	2017	Conversion timing of seafarer's decision-making for unmanned ship navigation	The International Journal on Marine Navigation and Safety of Sea Transportation, 11(3)
102	Zhang, W., Meng, X., Yang, X., Lyu, H., Zhou, X.-Y., & Wang, Q.	2022	A practical risk-based model for early warning of seafarer errors using integrated Bayesian network and SPAR-H	International Journal of Environmental Research and Public Health, 19(16)
103	Zignego, M.I., Gemelli, P.A., Bertirotti, A., & Pagani, L.	2024	AI-powered emotion recognition for maritime safety enhancement	International Conference on Human Factors in Design, Engineering, and Computing
104	Zoubir, M., Gruner, M., Heidinger, J., Schwarz, B., Jetter, H.-C., & Franke, T.	2025	Autonomy aweigh: Evaluation metrics and supporting seafarers basic psychological needs in energy-efficient route planning DSS	Applied Ergonomics, 128
105	Zoubir, M., Gruner, M., Heidinger, J., Schwarz, B., Jetter, H.-C., & Franke, T.	2025	Bridging the gap on the bridge: Seafarers tasks and decision-making with DSS in energy-efficient route planning	Journal of Cognitive Engineering and Decision Making, 19(3)