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Constraints affecting the adoption of information and communication tools among purse-seine operators of Ratnagiri district, Maharashtra

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Abstract

The present study assessed the constraints affecting the adoption and effective utilization of Information and Communication Technology (ICT) tools and sea safety devices among purse-seine operators in Ratnagiri district, Maharashtra. The data were collected from 120 randomly selected purse-seine operators of three landing centres including Jaigad, Sakhri Nate and Mirkarwada through personal interviews using a structured and pre-tested interview schedule. The ICT tools assessed included marine compass, GPS, fish finder, wireless set, mobile phone, CCTV camera and transponder. Constraints were categorized into technical, economic, operational, human and behavioural, and information and communication and ranked using the weighted average method. The study revealed that economic constraints ranked first with weighted average score of 28.90 followed by technical constraints (28.02), information and communication constraints (27.38), human and behavioural constraints (25.86) and operational constraints (24.48). Among the economic constraints difficulty in replacing damaged or outdated equipment ranked first. In information and communication constraints poor network connectivity at sea is the major constraints whereas under technical constraints difficulty in understanding displayed information was the major constraints. The findings highlight the need for affordable technologies, local repair and maintenance facilities, reliable connectivity, practical training, regular safety drills and periodic institutional inspection to improve effective and sustained utilization among purse-seine operators.

Keywords: ICT tools, constraints, purse-seine operators

Introduction

The information and communication technology (ICTs) have ushered in an era of knowledge explosion in all spheres of human development and has further accelerated growth and development in all sectors. Fisheries is one of the fastest growing subsectors of agriculture, considered as sunrise sector and holds the hope and promise for meeting out the food and nutritional security of a vast majority of the world's population. Fisheries are very important to the economy and well-being of coastal communities, providing food security, job opportunities, income and livelihoods of coastal communities. In India, the fisheries sector has undergone considerable technological transformation through mechanization of fishing vessels and the integration of Information and Communication Technology (ICT) in fishing operations. ICT tools such as Global Positioning System (GPS), echo sounders, mobile phones, wireless sets and satellite-based advisory services have improved navigation, fish detection, communication, safety and decision-making, thereby contributing to fishing efficiency and reduction of operational risks (Lakra *et al.* 2021; Sabu and Shaijumon, 2017; Tilley *et al.* 2021) ^[4, 7, 9].

The world's most vulnerable profession is fishing at the sea. The majority of tragedies in the fishing sector were because of mistakes committed or because of human error (Patil *et al.* 2017) ^[6]. Purse seine fishing is a highly efficient and technology intensive fishing methods used to catch pelagic fish species. The operation involves encircling large shoals of fish using extensive nets, often in offshore waters, which exposes fishermen to greater risks such as sudden weather changes, equipment failure, and vessel collisions. ICT tools such as GPS, sonar, and communication devices play an important role in fish detection, navigation, crew coordination, and safety during operations. These technologies also support compliance with fisheries regulations and promote sustainable fisheries management in increasingly challenging marine environments (Tilley *et al.* 2021) ^[9]. However, the adoption of ICT technologies remains uneven among fishing communities due to differences in awareness, technical skills, income, infrastructure and accessibility (Kotta *et al.* 2020; Lakra *et al.* 2021) ^[3, 4]. The adoption of ICT tools among fishermen, especially in mechanized and motorized sectors, has been steadily increasing. Mobile phones and GPS devices are the most

commonly used technologies, while wireless sets and distress alert systems are gradually gaining importance (Sabu and Shaijumon, 2017) [7]. ICT tools improve communication, provide weather and PFZ advisories, enhance safety, and help increase catch efficiency and fishermen's income. However, adoption levels vary based on education, income, infrastructure, and awareness (Kotta *et al.* 2020) [3]. Therefore, the study was intended to assess the constraints in adoption of Information and Communication tools among purse-seine operators in Ratnagiri district, Maharashtra.

Materials and Methods

The study was carried out in the Konkan region of Maharashtra, specifically focusing on Ratnagiri district, based on a preliminary investigation of marine fishing activities and the prevalence of purse seine operations. The study focused on selected fishing villages and landing centres within Ratnagiri district where purse seine operations are prominent. The data were collected from 120 randomly selected purse-seine operators of three landing centres including Jaigad, Sakhri Nate and Mirkarwada. A thorough review of literature and discussions with an expert group were done in order to list out various constraints faced by purse seine operators in adoption of information and communication tools. A total of 25 constraints were then categorized under five heads viz. technical, economic, operational, human and behavioural and information and communication constraints.

Interview schedule was used to collect information regarding constraints faced by purse seine operators in adoption of information and communication tools in Ratnagiri district, Maharashtra. A five-point Likert scale was used to test the level of agreement of migrants towards the respective constraints. This scale was 1 to 5, where, 1-Strongly disagree, 2-Disagree, 3- moderately agree, 4-Agree and 5-Strongly agree. Weighted average technique was used to understand and rank various constraints faced by purse seine operators in adoption of ICT tools (Vankar *et al.* 2024; Pachkudve *et al.* 2024) [10, 5]. The weighted average was calculated as given below:

Weighted Average

$$= \frac{\sum (X_1 \cdot W_1 + X_2 \cdot W_2 + X_3 \cdot W_3 + X_4 \cdot W_4 + X_5 \cdot W_5)}{\sum (W_1 + W_2 + W_3 + W_4 + W_5)}$$

Where,

X_1, X_2, X_3, X_4, X_5 = Frequency of the respective responses

W_1, W_2, W_3, W_4, W_5 = Weighted values i.e., 1, 2, 3, 4, 5

Results and Discussion

Constraints faced by purse-seine operators in Ratnagiri district, Maharashtra, in the usage of Information and Communication Technology (ICT) tools were divided into five categories, viz., technical, economic, operational, human and behavioural, and information and communication. Table 1 and Fig. 1 presented the weighted average scores and rankings obtained for each constraint category. It is observed from Table 1 that economic constraints were the first and foremost ranked constraints faced by operators, with a weighted average score of 28.90, followed by technical constraints, which were ranked second with a weighted average of 28.02. Information and communication constraints were ranked third with a weighted average score of 27.38, while human and behavioural constraints were ranked fourth with a weighted average score of 25.86. Operational constraints were the least ranked category with a weighted average score of 24.48. These results indicate that high replacement costs, lack of local repair infrastructure, and limited network coverage act as critical bottlenecks in the effective adoption and utilization of ICT tools among purse-seine operators. Further discussion on each constraint in detail is discussed as follows.

Table 1: Constraints faced in the usage of ICT tools

Sr. No.	Constraint	Weighted average	Rank
1	Technical	28.02	II
2	Economical	28.90	I
3	Operational	24.48	V
4	Human and Behavioural	25.86	IV
5	Information and Communication	27.38	III

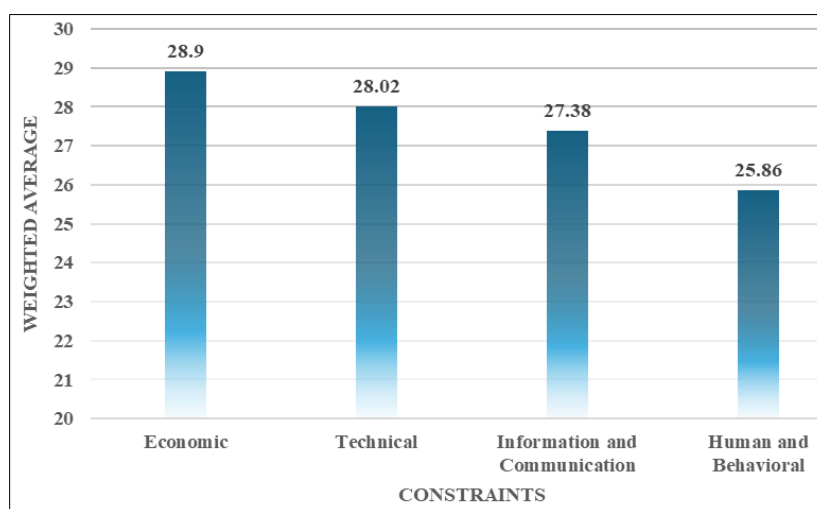


Fig 1: Constraints faced in the usage of ICT tools

Technical constraints

The technical constraints faced in the usage of ICT tools were presented in Table 2. Among the technical constraints,

difficulty in understanding the information displayed by ICT tools was ranked first, with a weighted average score of 29.07 and lack of local repair and maintenance facilities ranked

second (28.80). Whereas, the lack of knowledge regarding the proper operation of ICT tools available on fishing vessels least severe constraint with a weighted average score of 26.67. Similarly, Vankar *et.al.* (2024)^[10] reported that lack of training is one of the constraints in usage of ICT tools among

the trawler operators. Guguloth *et al.* (2018)^[2] studied the constraints in use of ICT tools in marine capture fisheries reported that 91.67% has major constraints regarding lack of knowledge.

Table 2: Technical constraints

Sr. No.	Constraints	Weighted average	Rank
1	Lack of knowledge on proper operation of ICT tools available on your fishing vessel	26.67	V
2	Difficulty in understanding information displayed by ICT tools	29.07	I
3	Frequent technical problems or malfunction of ICT tools	28.27	III
4	Lack of local repair and maintenance facilities	28.8	II
5	Power supply or battery-related problems	27.33	IV

Economical constraints

Table 3 illustrates the rank order of Economic constraints. It is observed that difficulty in replacing damaged or outdated ICT tools with weighted average score of 32.13 was ranked first by purse seine operators of Ratnagiri district followed by low income limiting investment in ICT tools (31.33). The high initial cost of ICT tools was ranked last, with a weighted average score of 22.53. The findings of the present study are

similar to other studies. Vankar *et.al.* (2024)^[10] in their study reported that high price of device was the major constraints faced by the trawler operators. Guguloth *et al.* (2018)^[2] reported most of the respondents felt the constraints on financial support for the purchase of ICT tools (97.50%). Similarly, Sharma and Sethulakshmi (2019)^[7] reported that fishers of Kerala were also facing financial constraint while getting ICT devices.

Table 3: Economical constraints

Sr. No.	Constraints	Weighted average	Rank
1	High initial cost of ICT tools	22.53	V
2	High repair and maintenance cost	28.67	IV
3	Lack of financial assistance or subsidy	29.87	III
4	Difficulty in replacing damaged or outdated ICT tools	32.13	I
5	Low income limiting investment in ICT tools	31.33	II

Operational constraints

The result in Table 4 reveals that under operational constraints, the risk of damage to ICT tools due to water and salt exposure was ranked first, with a weighted average score of 28.80, followed by difficulty in using ICT tools during

rough sea conditions (27.47) whereas ICT tools interfering with fishing operations was ranked last, with a weighted average score of 20.13. Vankar *et.al.* (2024)^[10] also revealed that the damage due to humid air was one of the major constraints faced by the trawler operators.

Table 4: Operational constraints

Sr. No.	Constraints	Weighted average	Rank
1	Difficulty in using ICT tools during rough sea conditions	27.47	II
2	ICT tools interfere with fishing operations	20.13	V
3	Lack of time to operate ICT tools during fishing	25.6	III
4	Inadequate space on vessel for installing ICT tools	20.4	IV
5	Risk of damage to ICT tools due to water and salt exposure	28.8	I

Human and behavioural constraints

It could be observed from the Table 5 that lack of training in the use of ICT tools was ranked first by purse seine operators with a weighted average score of 28.93 followed by dependence on others for operating ICT tools with a weighted average score of 27.87. while resistance to adopting new ICT tools was ranked last, with a weighted average score of 22.93.

The result of present study meets the results reported by other researchers in India. Guguloth *et al.* (2018)^[2] reported that the considerable proportion of the respondents felt the constraints like lack of training support on properly using ICT gadgets. Sharma and Sethulakshmi (2019)^[7] reported that lack of training/awareness programme was the major reason for low or no use of ICT tools among the fishers of Kerala.

Table 5: Operational constraints

Sr. No.	Constraints	Weighted average	Rank
1	Lack of training on use of ICT tools	28.93	I
2	Dependence on others for operating ICT tools	27.87	II
3	Resistance to adopting new ICT tools	22.93	V
4	Negligence or improper handling of ICT tools	24.13	IV
5	Low awareness about benefits of ICT tools	25.47	III

Information and communication constraints

The data in Table 6 depicts Information and communication constraints viz. poor network connectivity at sea was ranked first with a weighted average score of 29.73. followed by delays in receiving weather or fishing-related information (28.80) whereas non-availability of information in the local

language was ranked last, with a weighted average score of 25.07. The results of present study are supported by other studies in India. Guguloth *et al.* (2018)^[2] stated that language is the problem in understanding the application of ICT gadgets is the most severe constraints.

Table 6: Information and communication constraints

Sr. No.	Constraints	Weighted average	Rank
1	Poor network connectivity at sea	29.73	I
2	Delay in receiving weather or fishing-related information	28.8	II
3	Difficulty in accessing updated ICT-based information	27.33	III
4	Non-availability of information in local language	25.07	IV
5	Limited guidance from fisheries or extension agencies	26.0	V

Conclusion

The study concluded that purse-seine operators in Ratnagiri district face several constraints in the adoption and effective utilization of ICT tools. Difficulty in replacing damaged or outdated ICT tools, low income, poor network connectivity at sea, difficulty in understanding displayed information, lack of training, and inadequate local repair and maintenance facilities were the major constraints identified. To overcome this affordable ICT tools, financial support, training, local repair facilities, and reliable communication networks are essential for improving ICT adoption and enhancing fishing efficiency and safety among purse-seine operators in Ratnagiri. The study therefore emphasizes the need for coordinated efforts by Department of Fisheries, extension agencies and other supporting institutions to create a more favourable environment for ICT adoption among purse-seine operators in Ratnagiri district. Such interventions can contribute to improved fishing efficiency, communication, access to information and safety management in marine fishing operations.

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