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ICT and its Implication on Fishermen Income in Malaysia

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Abstract: As been profited by other industries, the evolution on ICTs has raised its impacts on the fisheries industries. Realizing the impacts, there is abundance of international studies that try to seek the association between ICTs usage and fishermen income. Nonetheless, reverse situation is found in Malaysia where there are still few local studies that place their interest on such association and the main attempt of this study is to investigate the relationship and the contribution of ICT usage towards fishermen income in Malaysia. This is quantitative study where questionnaire was used to gather the required data. A total of 400 registered fishermen from four fisheries districts in Malaysia have been randomly selected as the respondents. Based on the analysis employed, it can be seen that usage of sonar, echo sounder and radar are related to the fishermen income. In addition, further analysis has confirmed that these three tools are contributing towards fishermen income. To encourage ICTs usage among fishermen, it is recommended that the fishermen should be provided with ICT seminars and courses, supports such as financial, accessibility and services. Apart from this, selected behavioral factors should be taken into consideration while implementing strategies with regard to fishermen ICT usage.

Key words: Fishermen, ICTs, fishermen development, fishermen income fisheries industry, ICT development

INTRODUCTION

Fishermen in Malaysia: In Malaysia individual who wish to be a fisherman is encouraged to register with Department of Fisheries Malaysia (DOF) whereas such registration allows them to have their own identification card and receive monthly allowance and diesel/petrol subsidy from the government. Up to 2010 as demonstrated in the official website of DOF, there were 129,622 registered fishermen in Malaysia and 49,216 registered vessels in Malaysia (Table 1). All of the registered fishermen were settled in 81 fisheries districts across the country and majority of them can be found in Sabah/Sarawak zone. Looking at the data presented, there is an increasing trend of registered fishermen and vessels in Malaysia from 2008-2010 and plausibly introduction of fishermen allowance and diesel/petrol subsidy by the government have attracted more people to be part of this industry. To further enhancing the fishermen socio-economic aspects, government has initiated numbers of new program which consists the introduction of allocation worth USD100 million which is allotted for renovating fishermen settlement and building a new one.

Majority of fishermen in Malaysia are local people, nonetheless, albeit this big number, yet this industry is lacking of local supports and this can be proven when in 2010, a total of 36,566 foreign fishermen were hired to work on registered vessels; most of them were Thais (65.8%). In Malaysia, there are four categories of vessels and each category denotes their fishing area. Zone A covers 0.1-5.0 miles nautical, zone B covers 5.1-12.0 miles nautical, zone C0 covers 12.1- 30.0 miles nautical and zone C2 covers area >30.0 miles nautical. Zone A fishermen also known as coastal fishermen whereby a smaller fishing area enables them to make a daily trip and

Table 1: Number of registered fishermen and vessels of Malaysia

	No. of registered fishermen			No. of registered vessels		
Zone	2008	2009	2010	2008	2009	2010
Northern	19,294	23,629	23,535	5,556	7,469	7,937
East coast	24,139	27,069	29,956	5,747	6,819	7,169
Central	17,715	19,230	20,602	8,516	9,356	9,820
Southern	11,348	13, 945	14,149	5,657	6,854	6,666
Sabah/ Sarawak	37,185	41,759	41,380	15,483	18,247	18,164
Overall total	109,771	125,632	129,622	40,959	48,745	49,216

(Department of Fisheries Malaysia in 2008-2010)

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comparatively zone B, C0 and C2 fishermen are spending more time on the sea due to a larger fishing area. Among the popular fishing tool among Malaysian fishermen are drift nets, trawl nets and fish purse seines.

Total of marine fish productivity is encouraging where an increasing trend in term of fish landed has been identified. There is a significant different in term of marine productivity recorded in 2005 (1,209,601 ton) and 2009 (1,391,579 ton). There is a lot of factors that driven towards these changes and one of the possible factors is the ICT usage. Albeit there are numbers of literatures that tried to argue on its association with overfishing activities, doubtlessly, it has the capability to uplift the fishermen socio-economic aspects, particularly in increasing their income.

Impacts of ICT on the fishermen income: ICT offers number of advantages and benefits in which in some circumstances it coerces fishermen into shifting to more efficient technique. ICT has a huge impact on fishermen socio-economic development which later can attribute towards improvement of their productivity and generate more income for them.

Increasing productivity: ICT enables fishermen to double their productivity which generates higher income for them (Whitmarsh, 1990). Previously, fishermen are relying so much on the indigenous knowledge to identify the school of fish. Indigenous knowledge such as referring to the hill/mountain location or referring to the moon/star is still practiced by some of the fishermen. Relying on such skills subsequently results in a lower income among fishermen. Comparatively, ICT usage will significantly increase the fishermen income. Usage of tools such as sonar, echo sounder and radar provide fishermen with accurate information with regard to fish location. Apart from this, tool such as sonar provides extra information with regard to the quantity of fish available in certain identified fishing areas. Having such technology will assure fishermen to return to their jetty with a maximum catching.

Minimum utilization of resources: With the ability of ICT, it aids the fishermen to use the resources at the minimum level (Hassan *et al*., 2011). GPS for example will navigate fishermen exactly to the marked fishing location either day or night while sonar and echo sounder enable fishermen to detect accurately the school of fish. Consequently, such abilities reduce time and energy consumptions in their operating costs. Less time consumed denotes a lesser fuel used for seeking the fishing location which eventually reduces the operation cost for the fishermen. The similar function can be played by mobile phone where fishermen particularly the coastal fishermen, can communicate with their colleagues with regard to identified fishing location. Again, this will save their fuel, time and energy. Functions offered by sonar, echo sounder and radar able to reduce resources utilization. Such tools enable to pilot fishermen directly to the fishing location. Such ability will lessen the duration for the fishing operation. Time saving on the operation means a lesser money will be invest on the fuel, crew members' salary, food and beverages and also ice supply which eventually increases the fishermen profits.

Strengthening the markets and widening the linkages: Mobile phone and wireless set are useful tools with regard to marketing and networking aspects (Jensen, 2007; International Labor Organization, 2009). It allows fishermen to contact the dealer for discussing the best prices for their catching even before their arrival at the jetty. Apart from this, mobile phone widens the fishermen networking. Fishermen and their colleagues with related fisheries officers can share and disseminate information with regard to the best persons and locations that offer the best prices for their catching (Butunyi, 2009).

MATERIALS AND METHODS

Research design: This is a quantitative study where a questionnaire was used to gain the data needed. The questionnaire was pre-tested earlier at Panchitan village at Negeri Sembilan and the resulted cronbach alpha value has exceeded the recommendation of 0.70 by Nunnally (1978).

Population and sampling: The population of this study consists of 129,622 registered fishermen. According to Krejcie and Morgan (1970), the appropriate number of respondents for such population is 384 and this study intends to get a bigger number (400 respondents) as according to Najib (1999), a bigger sample will further strengthen the reliability and validity of the study. To get 400 respondents, this study has performed a multi-stage simple random sampling. First, four zones have been randomly selected; namely: Southern, Central, East coast and Northern. In the 2nd stage, states for each zone are listed and then a state was randomly selected to represent each zone and the selected states were Johor (Southern zone), Perak (Central zone), Terengganu (East coast zone) and Kedah (Northern zone). In the 3rd stage, fisheries districts of each states were listed and then fisheries districts such as Mersing (Johor), Larut-Matang (Perak), Kuala Besut (Terengganu) and Langkawi Island

(Kedah) were randomly selected to represent their state. Then, list of registered fishermen for the selected districts were gained and 100 registered fishermen from each fisheries districts were randomly selected.

Data collection: The data collection process took 6 months to be conducted, started from August, 2011 and ended in February, 2012. A number of trained and experience enumerators were hired to assist the data collection process where an enumerator took average of 25-30 min to complete a questionnaire. Apart from enumerators' assistance, collaboration from fisheries officers, boat/ship skipper, village and jetty leaders were gained to ease the data collection process.

Data analysis: To achieve the determined objective, descriptive and inferential analyses were employed. Descriptive analyses such as frequency, percentage, mean and standard deviation were performed to describe the general data of the study. To determine the relationship between ICTs usage and fishermen income, pearson product moment correlation has been employed while to determine the best set predictor towards fishermen income, multiple linear regression has been employed.

RESULTS AND DISCUSSION

This study covers four major zones in the Peninsular Malaysia which have high distribution of fishermen. A total of 400 fishermen were interviewed using a structured questionnaire. Table 2 shows the background of the fishermen. Majority of the fishermen in the study were male (98.8%) and Malays (90.5%). More than half (69.8%) of the fishermen were aged >40 years old and the mean average of age is 47 years old. It can be concluded that the respondents in this study is relatively an aged people and in fact there are fishermen who their age are >72 years old.

In terms of income, an average the fishermen are getting RM779.82 month^{-1}. This income is considered low as they spent on average 19 days a month at the sea. Thus, this category of income could be classified as below poverty level. Half of these fishermen (53.3%) had >21 years of experience in the fisheries industry and most of them (75.8%) belong to Zone A fishermen.

Fishermen use of communication technology: Several visits to the research location have been made prior to the real data collection. Based on observation at the unloading fish jetty, there is few fishermen's boat who is engaged in the fishing activities, had being equipped with communication technologies. This gave an opportunity for them to increase their fish catches. Among communication technologies that they used are GPS, sonar, wireless set, echo sounder, radar and mobile phone and are very relevant to their activities as fishermen at the sea.

Table 2: Profile of the fishermen (n = 400)

Profile	Percentage
Gender	
Male	98.80
Female	1.30
Race	
Malay	90.50
Chinese	9.50
Age category (years)	
15-19	0.00
20-24	2.80
25-29	6.30
30-34	8.00
35-40	23.30
>40	69.80
Mean	46.99
SD	11.97
Min.	20.00
Max.	72.00
Income of fishermen (RM)	
<500	35.70
501-1000	49.20
1001-1500	9.30
>1500	5.80
Mean	779.82
SD	482.31
Min.	150.00
Max.	3000.00
Experience as a fisherman	
<5	6.30
6-10	15.30
11-20	26.10
>21	52.30
Mean	24.50
SD	13.50
Average of days going out to the sea in a month	
1-15	26.90
16-30	73.10
Mean	19.10
SD	5.50
Category of fishermen	
Zone A	75.80
Zone B	15.00
Zone C0	8.50
Zone C2	0.80

Table 3 shows the level of communication technology used among fishermen. On the whole, technology such as GPS, sonar, wireless, echo sounder and radar are used at low levels by the majority of fishermen in this study. In fact, there are other communication technology tools that less being used in the fishing activities. This study gives an impression that the use of communication technology particularly the new technology for fisheries industries has not been received full respond among the fishermen. Results show that only a few fishermen using GPS (25.5%), sonar (9.8%),

Table 3: Usage of communication technology among youth fishermen (n = 400)

	Level usage (%)		
Communication technology	Low	Medium	High
GPS	71.0	3.5	25.5
Sonar	88.8	1.5	09.8
Wireless set	83.8	2.5	13.8
Echo sounder	81.5	2.8	15.8
Radar	95.5	1.0	3.5
Mobile phone	4.8	19.5	75.8

wireless sets (13.8%), echo sounders (15.8%) and radar (3.5%). This in return can give negative implications to their fish catching. However, mobile phones are used extensively by most of the fishermen (75.8%) and have been used as part of their communication activities for the fisheries industry.

Furthermore, the fishermen also are dependent on the traditional system in fishing activities such as weather forecasting techniques based on experience, deep fish detection techniques and relationship development networking techniques among the fishermen. This scenario is quite alarming due to the fact that current fisheries situation is more challenging if the fishermen do not use communications technology at the highest level. No doubt that this study found that most fishermen use mobile phones but its usage is very restricted in helping to increase their fish catching. The mobile phone applications which is limited to messaging functionality and communications are not sufficient to detect weather conditions at the sea, location of fish, safety at sea and fish marketing. When there is a low usage of communication technology, thus it has an implication on the fishermen income. Table 4 further describes the relationship between the level usage of communication technologies and the income of the fishermen.

ICT usage implication on fishermen income: Analysis employed has revealed that the average of fishermen monthly income is RM779.82 which slightly exceeds the poverty level set by Malaysian Economic Planning Unit (EPU). Based on the correlation analysis, low level of ICT usage among the fishermen will impinge negatively their monthly income. Table 4 depicts positive relationship between wireless set ($r = 0.239$, $p<0.05$) and fishermen income which reflects that frequent usage of such tool will significantly impinge their income. Nonetheless, low income gained reflected that majority of fishermen within this study still wireless set at a minimum level. Wireless set is useful in term of information sharing between the fishermen. They can share information regarding fish locations, the best places and the best persons that offer the best price for their catches.

Table 4: ICT usage relationship with fishermen income (n = 400)

	Fishermen income	
Frequency of ICT usage	r	p
GPS	0.098	0.051
Sonar	0.010	0.836
Wireless set	0.239	0.000
Echo sounder	- 0.122	0.015
Radar	0.197	0.000
Mobile phone	0.035	0.485

Echo sounder is identified to have negative and significant relationship with fishermen income ($r = -0.122$, $p<0.05$). Such relationship denotes that usage of such tool is not accompanied by any positive impacts on fishermen income. As majority of the fishermen studied are the zone A fishermen, usage of echo sounder is seen as irrelevant to them where such tool is more appropriate to be used by deep sea ships/boats (Zone C0 and C2). Apart from this, albeit echo sounder has been introduced within the fisheries industry in Malaysia since 1960s, its level of usage among the local fishermen is still low. Thus, it portrays that echo sounder is not a popular tool among the fishermen and not many of them are using it frequently.

Radar is another tool that is needed by the fishermen in conducting their fishing routines particularly for the C0 and C2 fishermen. Data demonstrated in Table 4 reflects that usage of radar have positive and significant relationship with fishermen income ($r = 0.197$, $p<0.05$). This study concluded that those with high level of radar usage will have a higher income. Plausibly, based on the radar suitability, the zone C0 and C2 fishermen are the main beneficiaries of the radar advantages. There is no surprising why radar can have something positive impact on fishermen income as some advanced radar can similarly operating as sonar and GPS.

In addition, GPS, sonar and mobile phone were detected to have no significant implication towards fishermen income. There are numbers of possibilities that might drive towards this. First, the functions redundancy between the ICT tools. For example, wireless set has function similarities with mobile phone and echo sounder has function similarities with sonar. Second, tool such as mobile phone may not directly contribute towards fishermen income. Within this study, it can be seen that the usability of mobile phone in fisheries industries is more on the safety and information sharing.

Contribution of ICT usage towards fishermen income: Analysis in Table 4 has narrated on the ICTs usage implication on fishermen income. Nonetheless, further analysis has been employed to determine the percentage of variance of contribution of all the ICTs studied and to achieve this, multiple linear regression has been

performed. Such analysis, albeit constructing the percentage of variance contribution, it enables to predict the best predictor towards fishermen income.

ANOVA test signals that there are significant difference in the variance ($F = 18.61$, $p<0.05$) between usage of technology and fishermen income. Multiple regression analysis using stepwise method has confirmed that there were only three factors that can be the predictor towards fishermen income. Nonetheless, this study demonstrates model 3 as the fit model which is presented in Table 5.

Overall, the resulted model has indicated that a total of 12.4% of variance ($R^2 = 0.124$) of wireless set, echo sounder and radar usage contribute towards fishermen income. The percentage of contribution is relatively low and there are other factors (87.6%) contribute towards the fishermen income. Other possible factors can be driven by factors other than ICT usage. The main problem that may encourage them to utilize the ICTs is their financial capability. In addition, behavioral factors; such as social influence, facilitating condition, behavioral intention and voluntariness of use teknologi komunikasi could be the mediating factors which are not covered by the analysis. Nonetheless, results of this study is relevant in predicting contibution of ICT usage towards fishermen income. It can be predicted that usage of wireless set contributes 5.7% ($R^2 = 0.57$) variance (changes) to the fishermen income. Usage of this tool was detected as the main contributor in the regression equation (income of fisheries = 752.125+155.902 (wireless set) −114.823 (echo sounder) +98.765 (radar). A minimum usage of echo sounder in fishing activities will contribute 5% increase on fishermen income ($R^2 = 0.050$) and radar usage will contribute 1.7% ($R^2 = 0.017$) on fishermen income (Table 6).

Table 5: ANOVA test (n = 400)

Sources	df	SS	MS	F	p-value
Regression	3	1.146E7	3820630.229	18.610	0.000[c]
Residual	394	8.089E7	205303.546	-	-
Total	397	9.235E7	-	-	-

Table 6: Multiregression analysis on ICT usage and fishermen income

Model (3)	Unstandardized coefficients (B)	Standardized coefficients (β)	t-value	p-value
Constant	752.125	-	29.609	0.000
Frequency of ICT	155.902	0.383	6.031	0.000
usage (wireless set)	-	-	-	-
Frequency of ICT	-114.823	-0.297	-4.829	0.000
usage: Echo sounder	-	-	-	-
Frequency of ICT	98.765	0.137	2.725	0.007
usage: Radar	-	-	-	-

Model	R	R^2	Adjusted R^2	R change
1	0.239[a]	0.057	0.055	0.057
2	0.328[b]	0.108	0.103	0.050
3	0.352[c]	0.124	0.117	0.017

[a]Predictors: Constant, frequency of ICT usage: Wireless set; [b]Predictors: Constant, frequency of ICT usage: Wireless set, kekerapan penggunaan alatan ICT: Echo sounder; [c]Predictors: Constant, frequency of ICT usage: Wireless set, frequency of ICT usage: Echo sounder, frequency of ICT usage: Radar

CONCLUSION

Any industry needs ICT in their development process. ICT roles in daily routines particularly on enhancing the effectiveness of their tasks are undeniable and this eventually will generate more income for them. Fisheries industry is one of the main beneficiaries of ICT advantages. As the main player in the fisheries industry, fishermen should not left behind in term of ICT utilization and should use it in increasing their monthly income.

This study noted that lower income gained among the fishermen can be associated with their low level of ICT usage while conducting their fishing routines. Minimum usage of advanced technologies such as wireless set, echo sounder and radar can significantly impinge fishermen income. Albeit usage of GPS, sonar and mobile phone were detected to have no significant relationship with fishermen income, the fishermen should be encouraged to use it due to its huge advantages and benefits on fishermen fishing activities particularly on enhancing their safety aspects and widening the marketing linkages.

RECOMMENDATIONS

This study would like to recommend that selection of ICT within the boat should be based on the functions of ICTs. If there are any functions similarities between ICTs, the fishermen should choose it based on their optimum functions. This is essential as it can minimize the operation cost. For example, there is no need for coastal fishermen with wireless set to use mobile phone as both of the tools have similar functions.

Based on the results gained, it can be seen that concern parties should encourage and motivate the fishermen to take advantages of benefits offered by ICT tools such as wireless set and radar to further increase their income. Through series of ICT seminars and courses, the fishermen should be informed comprehensively on the functions of wireless set, radar and echo sounder in fisheries activities. Supports such as financial, accessibility and services should be taken into the concern parties consideration as it can be an effective step to further enhance fishermen usage of wireless set and radar. Apart from this, aspects such as social influence, facilitating condition, behavioral intention and voluntariness of use in ICT usage should be instilled on concern parties strategies and plannings in enhancing ICTs usage among fishermen.

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