International Scholars Journals

Advances in Aquaculture and Fisheries Management ISSN 2756-3278 Vol. 12 (5), pp. 001-011, May, 2024. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Harnessing ICT for Sustainable Fisheries Development in Malaysia

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Accepted 29 January, 2024

There is a considerable relationship between information and communication technology (ICT), community and industry development. Abundance of previous research have tried to investigate ICT benefits for groups such as farmers, rural community, urban community, students, teacher and businessmen but yet there has been very little research on the roles of ICT can play for the development of the fisheries industry and the fishermen. Based on this problem statement, this paper aim to fulfill the three objectives determined which are to 1) to identify the most preferred ICT among the fishermen; 2) to identify the problems and obstacles faced by the fishermen in using ICT and 3) to determine the benefits that ICT can offer to the fishermen. This is a qualitative study; data was gained through four in-depth interviews guided by an interview guide with responsible agencies officers and fishermen. The questions served as a guide, but allowed respondents freedom and flexibility in their answers. ICT in this paper refer to global positioning system (GPS), sonar, wireless set, computer, internet and mobile phone. Based on the results gained, it can be concluded that GPS is the most preferred ICT among the fishermen. Among problems that need to be overcome to further encourage ICT usage among the fishermen are the negative attitude towards ICT usage, expensive cost, still depends on the traditional way, no exposure on ICT usage and ICT benefits, and no need for them to use the computer and the internet and increasing age. Based on the analyses done, it can be concluded that ICT offers a lot of benefits such as increasing socio-economic level of the fishermen, increase fishermen knowledge and skills on ICT, ease the communication process and enhance the safety aspects of the fishermen when they are on the sea. Based on the results gained it is recommended that the number of ICT seminar, workshop and course given to the fishermen should be doubled with the older fishermen should be included as one of the target groups while ICT subsidy for the fishermen can be given to the fishermen who need it.

Key words: Fishermen, ICT, fisheries industry, fisheries productivity.

INTRODUCTION

Development of information and communication technology in Malaysia

Information and Communication Technology or ICT has a huge potential for providing appropriate knowledge and skills for the community. ICT is a phenomenal growth in creating a knowledge based society with more conscious, humane and better informed community. Realizing the importance of ICT, the Malaysian government has already implemented a number of ICT projects, programs, agendas, strategies and initiatives for the purposes of assisting and strengthening the development of this country and its citizen. Historically, ICT was first brought to Malaysia through the introduction of the first telephone line in 1874 and the first computer system was introduced in Malaysia in 1966 (Musa, 2010). Things have been great after the introduction of internet in Malaysia in 1988 and were further strengthened with the

introduction of broadband services in 2001. Since the 6th Malaysian plan (6MP) till the recent one, the 10th Malaysian plan (10MP), there are a lot of ICT projects, programs, agendas, strategies and initiatives that have been initiated to meet the demand of the community modernization. Within these periods, projects such as multimedia super corridor (MSC), multimedia university (MMU), e-government services, Rural Internet Center, Rural Info Center, Smart School, e-integration and e-home-stay have been initiated. One of the significant ICT strategies that has been implemented is the National Strategic ICT Roadmap that has identified three technology focus areas which are 1) wireless sensor networks 2) predictive analytic and 3) 3-dimensional internet, all of these are believed to further advance Malaysia economically and technologically in the future and can aid in fulfilling the aim of vision 2020. Another example of great ICT projects which have been well developed are the two famous government ICT projects, the Rural Info Center and the Rural Internet Center that are specifically established for the purpose of encouraging and exposing ICT usage and benefits to the rural people (Musa, 2010). Interestingly, a number of these ICT centers are established near to the fishermen community settlement, for example Rural Internet Desa in Kuala Besut and Rural Internet Desa in Marang, both located in Terengganu, a state in east coast of Malaysia that is highly associated with fisheries industry. The outcomes of such projects, programs, agendas, initiatives and strategies brought by the government have already brought its impact in term of community ICT usage and possession (Jusang et al., 2010 and Narimah et al., 2010). Referring to the recent statistic, provided by Malaysian communication and multimedia commission (MCMC), almost 78 million SMS have been sent by the Malaysian, 28.2% of Malaysian household posses' personal computer and 21.1% of Malaysian household have internet connection at their house. Moreover, according to MCMC, in 2007 the Malaysian internet access consumer satisfaction index for broadband services was indicating a score of 3.47 (out of 5.00) (Malaysian Communication and Multimedia Commission, 2008). Conversely, Murphy (2008) has stated that on average Malaysians allocate two hours and 47 min on internet usage a day. Despite ICT has been used for rural development, it seems that ICT also has been used for fisheries industry development and tools such as GPS can be considered as the most preferred ICT tools based on its reasonable price and its beneficial function such as increase socio-economic level of fishermen, enhancing safety aspects and increase ICT knowledge and skills, this issue will be discussed later in this paper.

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Abreviations: 6MP, 6th Malaysian plan; **10MP,** 10th Malaysian plan; **MSC,** multimedia super corridor; **MMU,** multimedia university; **MCMC,** Malaysian communication and multimedia commission; **DOF,** department of fisheries; **LKIM,** fisheries development authority of Malaysia; **MAAI,** ministry of agriculture and agro-based industry; **KUNITA,** women entrepreneurs group within the fishermen community; **SIRIP,** fisheries information network system; **KPSP,** fisheries resources management community; **P&D,** demonstration and trial; **UIAT,** agro based industry entrepreneurs; **ZIA,** zone industry aquaculture; **HIP,** high impact projects; **VMS,** vessel tracking and monitoring systems; **VTU,** vessel tracking unit.

BACKGROUND OF FISHERIES INDUSTRIES IN MALAYSIA

Responsible agencies

To develop the fisheries sector, the Malaysian government has established two agencies which are department of fisheries (DOF) and fisheries development authority of Malaysia (LKIM). These two agencies are put under the ministry of agriculture and agro-based industry (MAAI). DOF is responsible for ensuring the fisheries sector as a productive sector in Malaysia and they are also responsible for enhancing the socio-economic level of the fishermen. LKIM on the other hand has been given the responsibility of developing the socio-economic status of the fishermen community with the focus on increasing their income as well as to extend and develop the fisheries sector in Malaysia. Under these two agencies a lot of effective programs for fisheries sector and fishermen have been initiated. Programs such as Aquaculture Industrial Zone and High Impact Project, Desa Wawasan Nelayan and KUNITA (women entrepreneurs group within the fishermen community) are well known with their success. DOF and LKIM have taken a wise step in cultivating ICT culture among the fishermen through the introduction of online systems for the usage of fishermen. Online systems such as e-diesel, e-declaration, fish online, e-entrepreneurs, e-extension and e-aquaculture for example will educate and encourage fishermen to use ICT. On top of that, DOF and LKIM have persistently conducting a series of ICT courses and seminars related to usage of ICT tools such as GPS, sonar, echo sounder, computer and internet.

Fisheries districts in Malaysia

Fisheries industry is a developing industry in Malaysia. This industry without doubt has helped to flourish the economic activities of the country. Moreover, the role of the fishermen in sustaining the food supplies of this country is essential. Up to this date, based on the recent statistic provided by the DOF, there are 74 fisheries district in Malaysia where more than half of the districts

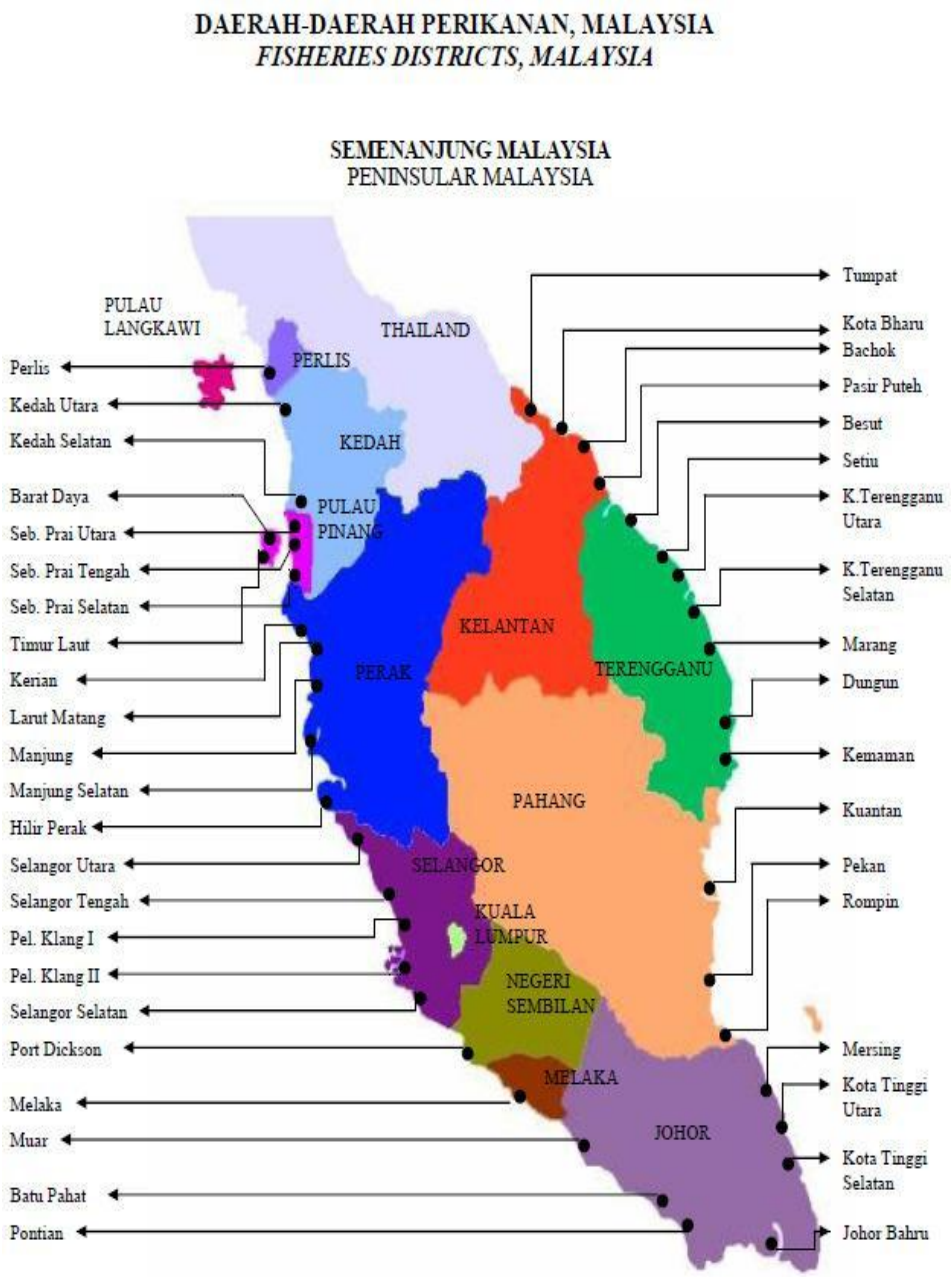

Figure 1. Fisheries Districts in Peninsular Malaysia. Source: Department of Fisheries Malaysia (2009).

(42) are located at the Peninsular Malaysia and 32 of the districts are located at the Sabah/Sarawak Zone. Sabah is the state with the highest number of fisheries district (16 districts), followed by Sarawak (15 districts) and Johor (8 districts) (Figures 1 and 2).

Number of registered fishermen in Malaysia

In Malaysia, fishermen are encouraged to register themselves by applying for license from DOF. As they get their license they will be given a number of incentives such as subsidized diesel and cost of living allowances. Data in Table 1 shows that Malaysia has a huge number of registered fishermen. As stated, the number of registered fishermen in 2005 was 90,702, in 2006 it increased to 97,947, in 2007 it increased to 99,617, in 2008 it increased to 109,771 and in 2009 it kept increasing to 125,632. In 2009, Sabah recorded the highest number of registered fishermen (24,691), followed by Sarawak (16,278) and Perak (12,156).

It is a good indicator that the number of fishermen in

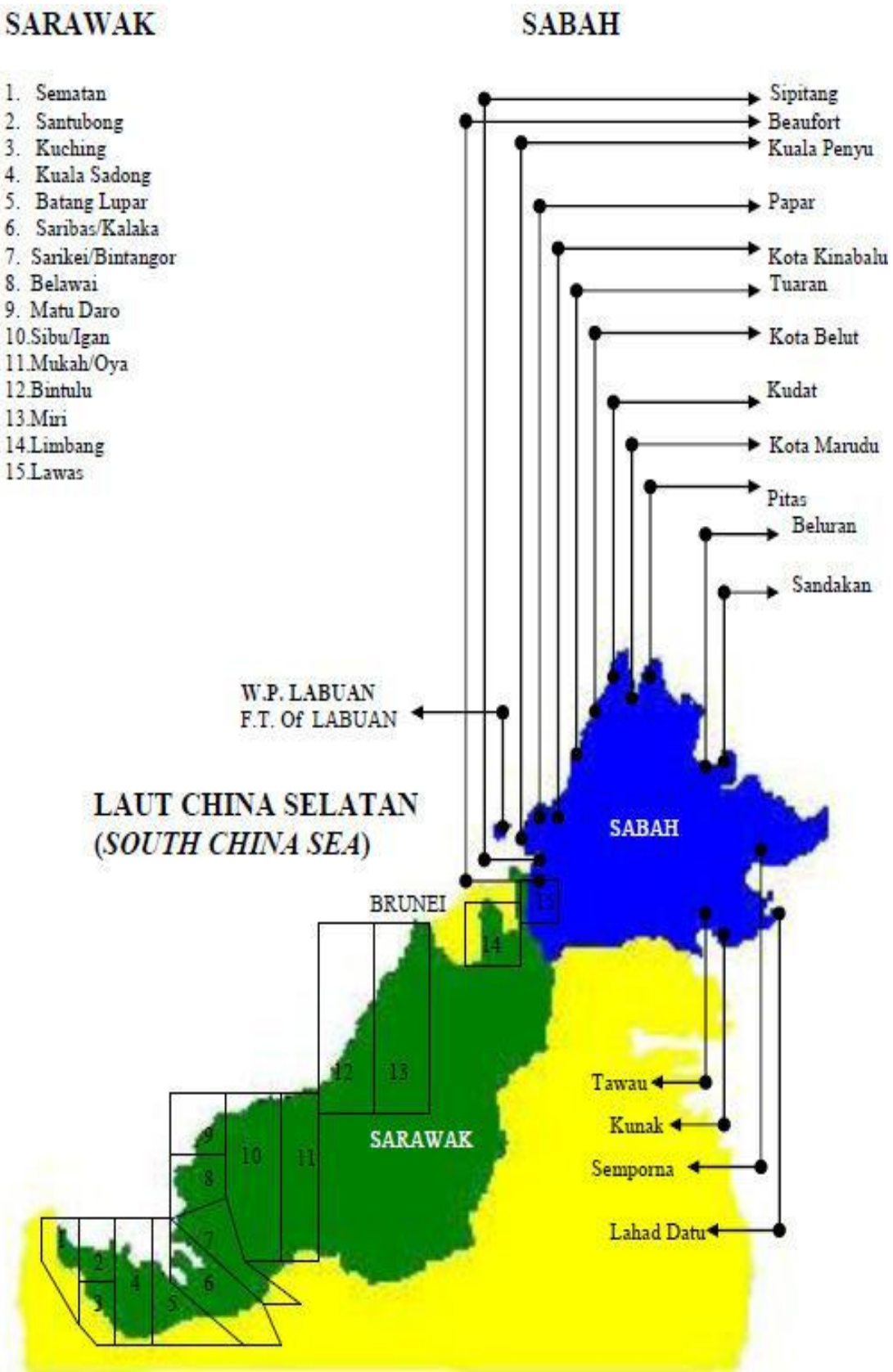

Figure 2. Fisheries Districts in Malaysia (Sabah and Sarawak Zone). Source: Department of Fisheries Malaysia (2009).

Table 1. Number of registered fishermen in Malaysia 2005-2009.

Zone		Number of Registered Fishermen in Malaysia 2005-2009				
	State/Year	**2005**	**2006**	**2007**	**2008**	**2009**
	Perlis	4,960	5,156	5,766	5,825	6,905
Northern	Kedah	7,215	7,936	8531	9,429	11,184
	P. Pinang	3,089	3,066	3193	4,040	5,540
Total		15,264	16,158	17,490	19,294	23,629
	Kelantan	5,695	6,007	6,714	8,478	9,624
East Coast	Terengganu	8,706	8,670	8,651	9,007	10,421
	Pahang	4,539	5,497	5,559	6,654	7,024
Total		18,940	20,174	20,924	24,139	27,069
Central	Perak	8,234	9,143	10,580	10,516	12,156
	Selangor	5,799	6,241	7,078	7,199	7,074
Total		14,033	15,384	17,658	17,715	19,230
	Malacca	1,330	1,112	1,273	1,281	1,844
Southern	Negeri Sembilan	295	300	353	361	460
	Johor	9310	9,620	9,034	9,706	11,641
Total		10,935	11,032	10,660	11,348	13, 945
	Sarawak	10,344	13,913	11,440	12,694	16,278
Sabah and Sarawak	Sabah	20,845	20,845	20,845	23,673	24,691
	Federal Territory of Labuan	341	441	600	818	790
Total		31,530	35,199	32,885	37,185	41,759
Overall total		90,702	97,947	99,617	109,771	125,632

Sources: Department of Fisheries Malaysia 2005-2009.

Malaysia keeps on increasing year by year and bring us to a probability that the community has already believed that this industry has the ability to be the main sources of their income. Parallel with this, it is a wise step for the related agencies to encourage fishermen to use ICT as it has the potential to bring a significant impact on their productivity.

ICT and fishermen

If previously ICT and fishermen seem cannot be related, but not anymore on this day. The existence of ICT tools such as GPS, sonar, wireless set, computer, internet and mobile phone have indeed assisted fishermen a lot. Their role in developing the socio-economic aspects of the fishermen cannot be denied and there is abundance of previous studies that have proven this. ICT tools are able to save the cost, time and energy of the fishermen and mobile phone and internet for example will provide opportunities for the fishermen to get the best price of their catch from the dealer even before they dock (Lal, 1999; Rao, 2004; Abraham, 2007; Barba-Sanchez, 2007; Abdul Razaq et al., 2009 and Bahaman et al., 2009). Norizan (2009) has added by saying that ICT tools can be a medium for e-entrepreneurship among its users (including the fishermen) which encourage them to be involved in business activities which will further boost their socio-economic level.

Table 2 has clarified the functions and roles that can be played by the ICT in developing the fisheries industry in Malaysia.

Besides the emergence of new ICT tools such as GPS and sonar, and the existence of ICT tools such as computer, internet, wireless set and mobile phone, responsible agencies such as DOF and LKIM have further strengthened the ICT environment for the purpose of developing the fishermen ICT skills and knowledge. DOF for example has introduced Fisheries Information Network System or SIRIP. Under SIRIP, among the online programs and services introduced are:

1. e-Training
http://eservices.dof.gov.my/ePerkhidmatan/index.php?

Table 2. ICT tools functions and benefits for fishermen.

ICT Tools	Functions/benefits
GPS	Marking the spots of the fish location, it can assist the fishermen to return exactly to the right place whether its daylight or dark. It will provide information such as latitude, longitude, altitude, surface speed, sunrise and sunset times, odometer and accuracy warning system.
Sonar	Through sonar, fishermen can get a complete, immediately up to date, available map of the whole fishing area showing the exact location, extend, density, depth, movement, species and size of all fish shoals. In addition, information regarding sea bottom such as depth, contours, slopes and stones can easily be gained.
Wireless set	It enhances the security aspects of the fishermen. If anything happens to them at the sea they can communicate with other vessels and the responsible agencies so that immediate action can be taken. On top of it, they can immediately share information regarding the fishing spots with the others. Moreover, through wireless set they can deal a better price with the dealer even when they are still on the sea.
Computer	For record purposes (ex: profit and loss, species caught, weather condition, markets, etc)
Internet	To seek, disseminate and share fisheries related information such as market price, online applications, weather conditions, professional advices, loan services, business opportunity, etc among/between colleague and related agencies
Mobile phone	To seek, disseminate and share fisheries related information such as market price, online applications, weather conditions, professional advices, loan services, business opportunity, etc among/between colleague and related agencies. Moreover, through mobile phone they can deal a better price with the dealer even when they are still on the sea.

mod=authentication&opt=login&spage=1

2. e-Extension
https://eservices.dof.gov.my/ePerkhidmatan/index.php?mod=authentication&opt=login&spage=2

3. e-Aquaculture
https://eservices.dof.gov.my/ePerkhidmatan/index.php?mod=authentication&opt=login&spage=3.

4. VMS Web

Besides DOF, LKIM is another agency that is responsible of strengthening the socio-economic level of the fishermen. To further encourage fishermen use of ICT, LKIM has taken a wise step by introducing a number of online services such as:

1. e-License:
http://elesen.lkim.gov.my/SPB/SPBOnline/Menu/index.aspx
2. e-fund: http://dananelayan.lkim.gov.my
3. e-fishermen:
http://ediesel.lkim.com.my/Login.aspx?ReturnUrl=/Default.aspx
4. Fish online: http://risikan.lkim.gov.my
5. e-declaration: http://epengisytiharan.lkim.com.my

METHODOLOGY

A qualitative method has been employed in this research to provide an in-depth description of preferred ICT, benefits and problems of ICT usage among fishermen in Malaysia. Among qualitative research traditions, the phenomenology approach was the most appropriate for this study as it provides the way to investigate lived experience of several individuals on the use of the technology and their interpretation or understanding from the meaning of these experiences (Creswell, 2007; Marshall and Rossman, 2011). It is aimed to develop a rich or thick phenomenological description of the phenomenon being investigated in a particular context.

The number of respondents was determined according to the quality of the data collected and findings as it was suggested in most qualitative methodologies. The researcher continued to conduct interviews until they believed that it had reached a point of saturation. The saturation point is referred to as the moment when a researcher arrives at an understanding of the experience and this understanding will not be altered through further discussion with participants (Laverty, 2003).

In this regards, the researcher managed to get four fishermen from different groups, background, ages, employment positions and ICT used. This variation enabled the researcher to explore their experience in using the ICT. In-depth interviews had been conducted among the two fisheries officers and the two registered fishermen guided by an interview protocol. The interview protocol was prepared for the purpose of keeping to a standard interview procedure with each participant, and maintaining the flow of conversations. The key questions were initially prepared based on the literature related to use of information and communication technology among fisheries industry. The selection of these samples was through the Fisheries Development Authority of Malaysia.

The two fisheries officers age between 40 to 50 years old and have involved in the fisheries industries for more than 15 years while the two registered fishermen were age between 50 to 60 years old and have the experience of being a fisherman for more than 30 years. The participants have rich experience in fisheries and using the technology. Generally, the interviews took around one hour and a half to two hours, depending on how open and talkative the respondent was. The interviews began slowly with a

small talk to get to know the background of the participant.

Questions asked to the respondents for the in-depth interviews were designed to achieve the objectives of this paper which are; to identify preferred ICT among fishermen in Malaysia; to reveal the obstacles and problem faced by fishermen in using ICT; and to determine the benefits of ICT usage for fishermen. The questions served as a guide allowing respondents freedom and flexibility in their answers. Questions pertaining to types of benefits offered by ICT took the longest time and were discussed intensely.

Data gained were later transcribed verbatimly and analyzed. Further, data was analyzed by using interpretive and thematic analysis particularly the interview data. During the process of analysis, sub-categories were emerged and created and later named it according to their themes. The interview research upon which this analysis is based is subject to a double interpretation (Siti et al., 2008). Firstly, is the interpretation which the fishermen bring to their own experience, and the one which they shared with the researcher; secondly, is the interpretation which the researcher made of what they said. The fishermen's interpretation depends on their attitude towards using the technology and the discourse which they have accessed and through which their subjectivities are constructed. Our interpretation depends on these things also, with the important addition of a theoretical and conceptual discourse, which constitutes the framework of our analysis. Member checking has been conducted with the participants and also among the researcher to confirm the accuracy and the interpretation of the transcribed data. For the purpose of secrecy, the participants name appeared in this paper are not their real name. Based on the analysis, there are four main themes emerged: preferred ICT among the fishermen, obstacles and problems in ICT usage, and benefits of ICT usage.

RESULTS

Preferred ICT among the fishermen

From the data analyzed it can be concluded that GPS is the most prefered ICT among the fishermen. They use GPS for marking the spots where a lot of fish can be caught, and they claimed that they can return exactly to the right place whether its daylight or dark. GPS unit also will indicate to them the latitude, longitude, altitude, surface speed, sunrise and sunset times, odometer and accuracy warning system. Some of the respondents approved these findings by saying:

'They can know exactly the fishing spot, which was marked previously. Previously, they just guest where is the fishing spot and drop their net, but not anymore currently, they already know the marked fishing spot through the GPS' (Jonathan, Fisheries Officer 2)

"GPS ease the fishermen in their activities. Compared to the past, they consume a lot of time to search for the fishing spot, they depend on the traditional way to do that, but now with the existence of GPS, it will directly bring the fishermen to the determined spot"(Jonathan, Fisheries officer 2).

Fishermen perceived GPS is easy to be used. The availability of local language and simple English used in the tool is one of the main reasons why they preffered it compared to other ICT tools. Besides, they said GPS focuses on only one function which is to detect and mark the fishing spot and this make things easier for them to learn the function of GPS. They also claimed that they are frequently using this tool and bring it everytime they go to the sea. Some of the respondents stated:

"It is very easy, those with low level of education also can use it easily, for us it is very useful…" (Peter, Fisherman 1).

"It is easy, just like counting from 1 to 10, what we want to do, where we want to go, it (GPS) will inform us. Which route we want to use, where we want to go, it (GPS) will guide us" (John, Fisheries officer 1).

"The GPS is not like the computer, the computer is complicated, a lot of things need to be done in order to operate the computer. Like GPS even though it is operated in English, the instructions given are simple. To use the GPS we only need three to four steps, it is much easier if we use it frequently, it is very easy.."(John, Fisheries officer 1).

Obstacles and problems in ICT usage

Based on the data analyzed, it can be concluded that there are a number of factors that have hindered them from using the ICT, which are negative attitude towards ICT usage, expensive cost (especially computer and sonar), which still depend on the traditional way, no exposure towards ICT usage and ICT benefits, there is no need for them to use the computer and the internet; and increasing of age. Factors of increasing age for example has caused them not to go to ICT course and seminar conducted by the responsible agencies by claiming that at their age there is no more things need to be learnt. Besides, the negative attitude towards ICT usage emerged as one of the reasons why problem exists in using ICT among fishermen. Minority of the fishermen also do not use ICT as they still depend on the traditional way of catching the fish. The respondents also claimed that they do not use the computer and the internet and the main reason of this is that there is no need for them to use these two tools and the factor of cost.

"One of the factor is their attitude, they (the fishermen) said the area of their fishing activity is not too far away from the coastal areas and there is no need for them to use the GPS, but they don't realize how useful the GPS is if the weather condition changes drastically…." (Jonathan, Fisheries Officer 2).

"There is no exposure for the fishermen regarding the impact they will get from the ICT usage on their productivity, second is regarding the cost, cost is a big

problem for the low income fishermen. If the ICT cost them between Ringgit Malaysia two to three thousand, it indeed burden them…" (John, Fisheries officer 1).

"Cost is one of the factors; besides they are still lacking in term of ICT skills because they are still depending on the traditional way of catching fish, they based on their prediction.." (John, Fisheries officer 1).

"There is no need for them to use the computer and the internet, some of them have no time to use the computer and the internet as most of their time are spent on the sea…" (Jonathan, Fisheries officer 2).

"In recent times, there is no need for it (computer and the internet), it is very useful for our children but not for us…" (Peter, Fisherman 1).

Besides the problems and obstacles on ICT usage among the fishermen, the respondents do admit the needs and importance of ICT nowadays and claim that fishermen whether or not they have the financial capability must have their initiatives and alternatives to posses the ICT especially the GPS and sonar. This can be seen when one of the respondents claimed:

"Whether they can afford to possess it (GPS and sonar) or not, the GPS and sonar are very useful and beneficial to them. They know it (the usefulness and benefits) when they see their colleague use it, the benefits are very obvious and significant. So, some of them use their savings and borrow from their "tauke" (dealer)…" (John, Fisheries Officer 1).

Benefits of ICT usage

Increasing socio-economic level of fishermen

Usage of ICT tools such as GPS and sonar have been proved to increase the productivity and save the cost of the fishermen. As mentioned earlier, GPS and sonar are able to mark the fishing spot and the fishermen can exactly go to the same location either at day or night. This ability is useful in term of saving the cost, time and energy of the fishermen. Besides GPS and sonar are two ICT tools that are able to detect location and quantity of the fish. Not like the previous days, fishermen depend on the traditional ways, with the existence of these tools, they are able to come back with a bigger quantity of fish. The respondents interviewed agreed with this by saying:

"Previously if we find a fishing spot, we set how many hours we took to go to the spot and then we marked the spot by flags. If we want to go to the same place the next day, we will drive the boat based on how many hours that we set the previous day, but that method was not economic, it was hard by that time to find the marked spot, sometimes we spend half a day just to search the marked spot. Is not anymore in these days, we are able to come home with a lot of fish" (Adam, Fishermen 2).

"Sonar is very useful in term of detecting where the location of the fish is, they also will inform us the quantity of the fish based on the color that appeared on the sonar. Compared to the past, we will search the fish location based on our prediction…" (Adam, Fisherman 2).

"It saves our cost, energy and time because we use sonar and GPS, it will drive us the exact location and we will not lost our way because these two tools will guide us"(Peter, Fisherman 1).

'If we want to know the location, the tools (GPS and sonar) can inform us exactly where is the location. Previously we just guessing' (Peter, Fisherman 1).

"The tool (sonar) will inform us of the fishing spot and the quantity of the fish at the location, if there is no fish then we will go to the other location…" (Peter, fisherman 1).

To increase ICT knowledge and skills

Previously, fishermen are always related to a lower educated group but now with the emergence of ICT tools, such as wireless set, computer, internet and mobile phone, fishermen are able to be informed with all of the updated information. The easiness of learning process of the ICT tools such as GPS and sonar enable fishermen to learn it easily thus increasing their ICT knowledge and skills. On top of it, online services provided for fishermen such as fish online, e-declaration and e-fishermen have the ability to disseminate all the information needed by the fishermen. They can get all the information needed at any time and at any place:

"Majority of the fishermen are not in a higher education group, but because of the learning process of these tools (GPS and sonar) is very easy, and they have no problem to learn it. It is true that they have low education background but it is not a problem for them to learn how to use the GPS and sonar…" (John, Fisheries Officer 1).

"They can enhance their ICT knowledge with the assistance of the related agencies/associations for example they can check through online whether their smart card is still active or whether their fishing license is still active or not…" (Jonathan, Fisheries Officer 2).

"Actually, they have no problems in learning the ICT, they enjoy using the services (online services) and facilities provided by the government…" (Jonathan, Fisheries Officer 2).

To ease the communication process

ICT offers the users an instant, simple and low cost communication. Wireless set and the mobile phone will help the fishermen to respond quickly to the market demand. Fishermen spend less time on idling on shore and at sea, whereas dealers go to the landing centers only when they receive the information (through wireless set and mobile phone) that the fishermen boats are about to dock. Besides, the wireless set and mobile phone can help the fishermen by providing the information of the related agencies on the places they can get a better price for their fish:

"The fishermen have wireless set, as well as the dealer. The wireless set can be the communication tool between the fishermen and the dealer when the fishermen are on the sea. They can contact the dealer to get the best price even when they are 10 miles away from the landing centers. By doing this, the dealer can wait for them even before they reached the landing centers.." (Jonathan, Fisheries Officer 2).

"there is a mobile phone line around the island area, so the dealer can contact us.. here, only the areas near to the island have a clear mobile phone line, if we are far away from the island, the dealer will contact any of our colleague that are near to the island and then our colleague will convey the dealer message to us through the wireless set.." (Adam, fisherman 2).

Enhancing the safety aspects

ICT tools such as wireless set, mobile phone and GPS will enhance the safety aspects of the fishermen in the sea. Wireless set and mobile phone can be used to communicate with the colleagues and agencies officers if there is anything happening to them on the sea. For example if their engine broke down on the sea, through the wireless set and mobile phone, immediate actions can be taken by their colleagues or the officers in charge. GPS, besides marking the fishing location for the fishermen, it is also responsible in informing the fishermen on any obstacles such as coral thus it can avoid any damage to the fishermen boat and more importantly it can avoid any accidents that might involve human life. GPS is also helpful in assisting the fishermen to find their way back especially in a bad weather condition:

.. in term of security, yes, that is the main function of the wireless set. Second it can be a communication tool among the fishermen when they are on the sea especially in term of sharing information regarding the location of the fish.." (John, Fisheries Officer 1).

... secondly, on our way to the fishing location, it (GPS) will inform us on any coral that might damage our boat, they will give us signal and after being informed we can immediately avoid the coral.. (Peter, Fisherman 1).

"… for communication among us (among fishermen) on the sea if there are accidents or anything happen to us (on the sea).." (Adam, Fisherman 2).

"..In a bad weather condition, such as heavy fog, storm and heavy rain, the vision is ambiguous, so we depend on the GPS to find back our home…."(Adam, Fisherman 2).

'Because it (GPS) can detect the way back, on the sea everything is same, they don't know which way is north and which way is south…' (Jonathan, Fisheries Officer 2).

DISCUSSION AND RECOMMENDATION

In this study, GPS can be seen as the most preferred ICT among the fishermen. A number of causes that drive to this preference have been detected. One of the causes is the perceived ease of GPS usage among the fishermen. The focus of the GPS function (only to mark the fish location) compared to the multi-function of computer and internet and the simple English used are the main reasons why fishermen perceive GPS easy to be used. To sustain perceived ease of GPS usage among the fishermen in Malaysia is important as Meso et al. (2005), have concluded that perceived ease of use can be a contributor for greater confidence thus create greater usage of ICT.

From the results gained, it has proven that ICT has a huge potential to enhance community socio-economy level. Usage of ICT such as GPS and sonar will enhance the productivity of the fishermen. On top of it, these two ICT tools are able to save the cost, time and energy every time the fishermen go to the sea. Interestingly, mobile phone and internet will provide opportunities for the fishermen to get the best price of their catch from the dealer. All of the results gained here is not surprising as it is in tandem with a number of previous studies (Lal, 1999; Rao, 2004; Abraham, 2007; Barba-Sanchez, 2007; Abdul Razaq et al., 2009 and Bahaman et al., 2009). Rao (2004) and Abdul Razaq for example have concluded that ICT while increasing its user productivity and work performance it also can be a solution for the problems of unemployment and hardcore poor. Norizan (2009) has supported what have been concluded by Rao (2004) and Abdul Razaq et al. (2009) by saying that ICT tools such as computer and internet will encourage e-entrepreneurship among its users which encourage them to be involved in business activities which will further boost their socio-economic level.

Previously there is almost no need for the usage of ICT

among the fishermen, but not on this day. As been proven by the results of this study, ICT can be a mechanism to enhance ICT skills and knowledge among the fishermen. Conversely, with the increasing ICT knowledge and skills among the fishermen, they are not depending anymore on the traditional way of catching fish. Interestingly, with the emergence of ICT, fishermen are always been informed with the updated news and information which in turn will enhance their standard of life as been claimed by Cecchini and Raina (2002). Grimes (2000) in his study revealed that ICT educate those who use it on something new which can be seen in this study.

The existence of ICT tools such as wireless set, mobile phone and internet has indeed helped a lot in term of providing fishermen an instant, cheap and effective channel of communication. In this study, through the usage of mobile phone and wireless set fishermen can communicate with their colleague in instant information regarding fish location. It also can act effectively when anything bad happens to them on the sea. Fishermen spend less time on idling on shore and at sea, whereas dealers go to the landing centers only when they receive the information (through wireless set and mobile phone) that the fishermen boats are about to dock.

As been mentioned, ICT will enhance the safety aspects of the fishermen. Wireless set and mobile phone for example will act as a communication tool between the fishermen and their colleague and also the responsible agencies. If anything happens to them on the sea, they can immediately contact their colleague and quick actions can be taken to save them. GPS also have the ability to enhance the safety aspects of the fishermen. GPS will inform the fishermen on any marked coral which can endanger and damage their boats. ICT tools without doubt have a huge potential to reduce the number of accidents on the sea and more importantly to reduce the number of casualties of fishermen on the sea. Results of this study are consistent with number of previous studies (Abraham, 2004; Lowrey, 2004). Lowrey (2004) for example has concluded that fishermen in Guinea are benefited by the usage of GPS. With the assist of GPS the fishermen are able to provide the coastguard station the exact location of the foreign poaching trawlers and with the information the coastguard officers are able to intercept the intruders.

To overcome the problems of ICT usage among the fishermen, first it is suggested that a series of ICT seminars, courses and workshops can be conducted with the older fishermen should be included as one of the target groups. This is important as exposure to ICT courses, seminars and workshops have a great potential for developing a better usage of ICT and creating awareness of how important the ICT is for the fishermen (Hayrol et al., 2010; Jeffrey et al., 2010; Bahaman et al., 2011). Of course all the seminars, courses and worksop must be conducted persistently. To have persistent training skills is important as it has been stressed by Carey et al. (2002), in which they have stated one of the important factors to enhance the ICT usage is the ICT education and trainings. Referring to Carey et al. (2002), the frequency of training skills attended will bring an impact on the ICT usage. Besides by having the training skills, it will inform the fishermen on how important the ICT is to their works and more importantly to their fisheries productivity.

Secondly, it is suggested that fishermen can be given ICT subsidy which allow them to possess ICT tools. There is a strong association between financial factors and ICT. For the low income group, their income has hugely obstructed them from buying any ICT tools. Flores (2003) has revealed that income can be the major factor for ICT usage and stressed that higher income people seems to have higher financial ability to possess ICT which in turn enhance their usage of ICT. Malamud and Pop-Eleches (2010) have come out with a good example on how countries such as Brazil, Uruguay, Peru and Columbia have successfully enhanced the ICT usage among the low income group through the introduction of subsidy on ICT purchase. It is possible for the same ICT subsidy to be given for the fishermen in Malaysia in order to encourage them to use ICT in their work. Through this type of subsidy there is also a possibility that the digital divide problems between higher income and lower income groups can be reduced.

Conclusion

The idea that ICT can be utilized to spur the development of the fishermen can be realized if only it involves all of the related parties, the fishermen, government agencies and also the non-governmental agencies. This article has revealed the roles ICT can play in assisting the development of the local fisheries industry. This study has demonstrated that GPS is the most preferred ICT among the fishermen and they claimed that easy to be learnt and used are among the main cause they choose GPS as their most preferred ICT. Conversely, a number of problems and obstacles in using the ICT especially the computer and the internet have been identified among the problems are negative attitude, expensive cost (especially computer and sonar) still depend on the traditional way, no exposure towards ICT usage and ICT benefits and there is no need for them to use the computer and the internet and increasing age. Besides these problems, fishermen must have their own initiatives to overcome all of the problems stated as they already knew the great impact ICT can offer them. This study has successfully fulfilled its third objective when a number of ICT benefits to the fishermen have been identified such as increasing socio-economic level of the fishermen, increase fishermen knowledge and skills on ICT, ease the communication process and enhance the safety

aspects of the fishermen when they are on the sea

REFERENCES

Abdul RA, Norhasni ZA, Jamaludin B, Pang SW (2009). Computer usage and achievement among adults in rural area Malaysia. J. Soc. Sci., 5(1): 1-8.

Abraham R (2004). Mobile phone and economic development: Evidence from fisheries industry in India. J. Inf. Technol. Int. Dev., 4 (1): 5-17.

Bahaman AS, Hayrol Azril MS, Musa AH, Jeffrey LDS (2011). Can technology acceptance model be applied on the rural setting: The case of village development and security committee in Malaysia. J. Soc. Sci., 7(2): 113-119.

Bahaman AS, Hayrol Azril MS, Md Salleh H, Musa AH, Narimah I(2009). ICT contribution in increasing agro-based entrepreneurs productivity in Malaysia. J. Agric. Ext. Soc. Sci., 5(3): 93-98.

Barba-Sanchez V, Martinez-Ruiz MP, Jimenez-Zarco AI (2007). Drivers, benefits and challenges of ICT adoption by small and medium sized enterprises (SMEs): a literature review. J. Problems Perspect. Manage., 5(1): 103-114

Carey J, Chisholm I, Irwin L (2002). The impact of access on perception and attitudes towards computers: an international study. J. Educ. Media Int., 39 (3&4): 223-235.

Cecchini S, Raina M (2002). Warana: The case of an Indian rural community adopting ICT. Retrieved from: http://www.comminit.com/en/node/147613/308.

Creswell JW (2007). Qualitative inquiry and research design: Choosing among five traditions (2nd ed.). Thousand Oaks, CA: Sage Publications.

Department of Fisheries Malaysia Statistic on Fisheries Sector in Malaysia, 2005-2009. Retrieved from: http://www.dof.gov.my/buku_perangkaan_tahunan_perikanan

Flores C(2003). Measuring the relationship between ICT use and income inequality in Chile. Retrieved from: http://utip.gov.utexas.edu/papers/utip_26.pdf.

Grimes S (2000). Rural areas in the information society: diminishing distance or increasing learning capacities? J. Rural Stud., 16(1): 13-21.

Hayrol Azril MS, Bahaman AS, Musa AH, Jeffrey DS (2010). Socio-economic factors that impinge computer usage in administration works among village leaders in Malaysia. Sci. Res. Essays, 5(23): 3623-3633. ISSN:1992:2248

Jeffrey LDS, Bahaman AH, Hayrol Azril MS, Musa AH (2010). Factors that influence attitude towards ICT usage among village administrator in Malaysia. Australian J. Basic Appl. Sci., 4 (10): 5214-5220.

Jusang B, Musa AH, Narimah I, Siti Zobidah O(2010). Profiling rural ICT projects: Recommendation for developing knowledgeable community. In Media and Agriculture Extension, Bahaman, A.S., U. Jegak and A. Khatijah, (Eds.). UPM Publisher, pp. 67-75.

Lal B (1999). Information and communication technologies for improved governance. Paper presented at African Development Forum, ADF 99, 24-28 October, 1999, Addis Ababa, Ethiopia.

Laverty SM (2003). Hermeneutic phenomenology and phenomenology: A comparison of historical and methodological considerations. Inter. J. Qual. Methods, 2(3): 21-35.

Lowrey P (2004). SFLP: Arming fishermen with GPS to combat poacher. Retrieved from: http://ictupdate.cta.int/en/Feature-Articles/SFLP-arming-fishermen-with-GPS-to-combat-poachers.

Malamud O, Pop-eleches C(2010). Home computer use and the development of human capital. Retrieved from: http://www.nber.org/papers/w15814.pdf?new_window=1.

Malaysian Communication and Multimedia Commission (2008). Q4, Communication and Multimedia, Selected Facts and Figures. Retrieved from: http://www.skmm.gov.my/facts_figures/stats/index.asp.

Marshall C, Rossman CB (2011). Designing qualitative research. (5th ed.). Thousand Oaks, CA: Sage Publications, 68(1): 41-48.

Meso P, Musa P, Mbarika V (2005). Towards a model of consumer use of mobile information and communication technology in LDCs: The case of Sub-Saharan. J. Afric. Inf. Syst., 15(2005): 119-146.

Murphy S (2008). Insights into Critical Trends that Are Shaping the Lives of Malaysian Consumers. Retrieved from:http://www.adoimagazine.com/newhome/images/_docs/5%20hot%20trends%20for%20Malaysia.pdf.

Musa AH (2010). Information and Communication Technology and Community Development. Paper presented at IPSAS Intellectual Discourse, IPSAS Meeting Room, University Putra Malaysia, Serdang, Selangor.

Narimah I, Musa AH, Jusang B, Siti Zobidah O, Yadi S, Zamre Y, Nurani K (2010). Profiling of Rural ICT Projects. In Media and Agriculture Extension, Bahaman, A.S., U. Jegak and A. Khatijah, (Eds.). UPM Publisher, pp. 48-66

Norizan AR (2009). Empowering the rural communities via the telecenters. J. Eur. Soc. Sci., 9 (3): 425-432.

Rao SS (2004). Role of ICTs in India' s rural community information systems. J. Information, 6 (4): 261-269.

Siti Zobidah O, Normaliza AR, Zaitul Azma ZH, Amini Amir A (2008). Urbanization and its implication on the Malay women's social interaction. Int. J. Hum., 6(7): 15-21