Development of Instrument on Youth Fishermen's Readiness to Use Geographical Positioning Systems in Their Fishing Operations

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Abstract: Technology usage has been recognized as one of the ways by which to further enhance the productivity of the fisheries industry. The main aim of this paper relates to this by seeking to develop an instrument by which to measure youth fishermen's readiness to use geographical positioning systems (GPS) in their fishing operations. The process of the instrument development starts from a literature review. Based on this review, a number of articles and the Extended Technology Acceptance Model (ETAM) are used by the researchers in developing the instrument. The instrument is then validated by a number of experts and instrument development meetings. After the validation process, the instrument is pre-tested among 30 youth fishermen in Terengganu, and, based on the reliability analysis performed, a number of modifications are conducted to further strengthen the instrument. The final version of the instrument consists of five parts: demographic information (consists of 13 questions), knowledge on GPS usage (four sub-parts and 22 questions), readiness (four sub-parts and 20 questions), problems (four sub-parts and 25 questions) and behavioral aspects (seven sub-parts and 45 questions).
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1. Introduction

As predicted by a number of local studies (Shaffril et al., 2013; Abu Samah et al., 2012; Wai et al., 2005), the climate in Malaysia is changing, and is expected to worsen in the future. Subsequent generations of the fisheries industry – i.e. youth fishermen – are expected to have to face this challenging phenomenon. This scenario will force them to overcome a number of negative consequences, one of which will be a depletion in the number of marine sources. In facing such consequences, the application of advanced technology such as geographical positioning systems (GPS) will go a long way towards assisting youth fishermen.

Current statistics provided by the Department of Fisheries Malaysia (2013) confirm that there are 134,110 registered fishermen in Malaysia. This demonstrates the strength of the fisheries industry in providing employment opportunities for the community, particularly youths. Though official statistics on the number of registered youth fishermen in Malaysia are still unavailable, demographic findings within local studies conducted by Omar et al. (2012), Shaffril et al. (2013) and Bolong et al. (2012) have consistently found that youths (aged 15-40) constitute 30% of their overall study samples.

GPS offers various beneficial functions for youth fishermen: it marks the spots where fish can be caught, and assists fishermen to return to the exact place, whether in daylight or darkness. Furthermore, GPS units indicate the latitude, longitude, altitude, surface speed, sunrise and sunset times, as well as odometer readings, and also serve as accuracy warning systems. Furthermore, usage of GPS offers a number of socio-economic benefits for youth fishermen. First, as GPS allows youth fishermen to guide their vessels directly to specific fishing spots, it enables them to reduce fishing operation time, which will then minimize their fuel costs as there is no need to spend long periods of time seeking out ideal locations (Omar et al., 2012). Second, by providing such precise location information, GPS assists youth fishermen in enhancing their fishing productivity and their income, as it results in a bigger catch (Abu Hassan et al., 2011). Third, GPS enhances fishermen's safety and security aspects. During bad weather, for example, field of vision may be limited; by relying on GPS, fishermen can return safely to their jetty (Omar et al., 2012). As suggested by Abu Hassan et al. (2011), GPS is also found to enhance

community technology literacy and skills, and reduce the digital gaps between those in rural and urban areas.

Though GPS has been recognized as providing significant help within fishing operations, it is questionable whether youth fishermen are ready to use such an advanced tool. In response to this, the development of an instrument by which to measure youth fishermen readiness to use GPS in their fishing operation is considered highly useful. A measurement of their readiness will provide valuable assistance to concerned agencies in developing effective plans and strategies by which to further enhance technology usage in the fisheries industry, particularly among young fishermen.

2. Material and Methods

The selection of items to be included in the questionnaire was based on a comprehensive literature review using a database of established online journals by publishers such as Science Direct (http://www.sciencedirect.com/), Taylor & Francis (http://www.tandfonline.com/), Sage Publications (http://www.sagepub.com/home.nav) and Emerald Publishing (http://www.emeraldinsight.com/). In addition, commercial search engines like scholar.google.com were used to find further relevant articles, and several hardcopy research articles, books, monographs, and project reports were identified from the Universiti Putra Malaysia library. The literature review resulted in an instrument that identifies youth fishermen's readiness to use GPS, and problems with this usage. After the completed questionnaire was constructed, it was presented to a number of ICT usage experts and at instrument development meetings. It was then pre-tested to measure its reliability. Via this reliability analysis, the researchers were able to identify the Cronbach's alpha value of each item used in the questionnaire. For this study, the Cronbach's alpha value was based on that suggested by Nunnally (1978), who recommended a value of 0.7 for an item to be considered reliable.

3. Results

The literature review resulted in an instrument consisting of five major parts, namely demographic information, knowledge on GPS usage, readiness of GPS usage, problems with GPS usage and behavioral factors. Each part is represented by several sub-parts (except for demographic information).

First phase of instrument development (literature review)

All of the questions included in the instrument were constructed based on a literature review. Following this, the researchers decided that the instrument would be rooted in the work done by Sustrisno and Lee (2010). Although Sustrisno and Lee's (2010) study focused on readiness and barriers of extension officers towards ICT programs, the researchers developed their instrument within the context of fishermen, and modified it based on a database of established online journals by publishers such as Science Direct (http://www.sciencedirect.com/), Taylor & Francis (http://www.tandfonline.com/), Sage Publications (http://www.sagepub.com/home.nav) and Emerald Publishing (http://www.emeraldinsight.com/). In addition, commercial search engines like scholar.google.com were used to find further relevant articles, and several hardcopy research articles, books, monographs, and project reports were identified from the Universiti Putra Malaysia library. Based on the first phase of the literature review, the researchers identified four main areas, as presented in Table 1.

Table 1: Parts constructed following phase 1 of the literature review

Parts	Sub-parts
Demographic	None
Knowledge on ICT usage	1. Basic knowledge on GPS 2. Purpose of GPS usage 3. Access to GPS 4. GPS training
Readiness	1. Readiness (Fishermen as a group) 2. Readiness (Individual) 3. Readiness (Infrastructure) 4. Readiness (Agencies)
Problems	1. Problems (Agencies) 2. Problems (Individual) 3. Problems (Technology) 4. Problems (Policy)
Behavioral	1. Attitude 2. Self-efficacy 3. Perceived usefulness 4. Perceived ease of use 5. Compatibility 6. Job relevance 7. Subjective norms

The second phase of the literature review focused on behavioral information. The researchers decided to construct the questions based on the Extended Technology Acceptance Model (ETAM), which is a continuation of a traditional model known as the Technology Acceptance Model (TAM). Although TAM is useful in certain areas, a number of studies have indicated a need to strengthen, modify and update it (Shih, 2004; Trombley and Lee, 2006; Hernandez et al., 2008). Hu et al. (2003) responded to this by initiating a modified TAM known as the Extended Technology Acceptance Model (ETAM). ETAM consists of six elements that determine technology usage, which are job relevance, compatibility, self-efficacy, perceived ease of use,

perceived usefulness and subjective norm. The instrument development here adds one additional factor, namely attitude. Several previous studies based on ETAM exclude attitude (Venkatesh and Davis, 1996; Hu et al., 2003; Shih, 2004). Nonetheless, studies completed by Simpson (2005), Kenneth and Liaquat (2008), Shiro (2008) and Loh et al. (2009) clarified that attitude is the main contributor towards technology usage. In addition, positive attitude is one of the main impingement factors for rural community technology usage, and it has been proven that positive attitude will gear communities towards learning something new (Zulkifli and Raja Maznah, 1994). The items developed were then tuned to suit the local setting.

Second phase of instrument development (to determine answer options)

The demographic part of the questionnaire consists of 13 questions, most of which are open-ended. However, closed-ended (yes or no) questions were also prepared in relation to gender, race, educational achievement, fishermen category and category of fishing areas. The second part, knowledge on GPS usage, consists of closed-ended questions. For the remaining three parts – readiness, problems and behavioral factors, answers are based on a five-point Likert-type scale including 1 = strongly disagree, 2 = disagree, 3 = moderately agree, 4 = agree and 5 = strongly agree. There are several reasons why a five-point Likert-type scale was chosen. First, as the majority of potential respondents – the youth fishermen – are expected to be among the lower educational achievement group, and unlikely to have been exposed to a survey process (Shaffril et al., 2013; Abu Samah et al.,2012; Omar et al., 2012), simplicity is vital as it will ease the data collection process for both the enumerators and the respondents, as they will easily comprehend the questions and answer options provided. Second, compared to closed-ended questions, Likert scale options permit the respondents to demonstrate degrees within their answers, despite the answers' simplicity, which gears towards less complexity and more consistent answers.

Third phase of instrument development (validation and pre-test processes)

To validate the instrument, it was presented to a number of ICT usage experts. It was sent to them via mail, and they were given a period of 10 days to review it and provide their comments. The instrument was then also validated from time to time by the research groups, as three instrument development meetings were held between January and February 2013.

The pre-test process took place at two areas in Terengganu – Kuala Paka and Kuala Terengganu. The process was held between February and March 2013. The first attempt (at Kuala Paka and Kuala Terengganu) of the pre-test managed to survey a total of 13 respondents, and the second attempt (at Kuala Terengganu only) managed to survey a total of 17 respondents. Both attempts together yielded a total of 30 registered youth fishermen as the respondents for the study. In order to identify suitable respondents, assistance from village leaders, skippers, jetty leaders and agency officers was sought. The pre-test was assisted by five experienced and trained enumerators, and was also monitored by the researchers. The survey method was employed to obtain the data needed.

Fourth phase of instrument development (reliability analysis)

Table 2: The Cronbach's alpha values

Parts	No of items	Cronbach Alpha Value
Demographic information	13	Not applicable
Knowledge on GPS usage		
Basic knowledge on GPS	4	Not applicable
Purpose of GPS usage	7	Not applicable
Access towards GPS	6	Not applicable
GPS training	5	Not applicable
Readiness (Overall)		.869
Readiness (Fishermen as a group)	5	.800
Readiness (Individual)	5	.857
Readiness (Infrastructure)	5	.697 *
Readiness (Agencies)	6	.914
Problems (Overall)		.794
Problems (Agencies)	6	.648*
Problems (Individual)	7	.671*
Problems (Technology)	7	.673*
Problems (Policy)	5	.848
Behavioral factors (Overall)		.931
Attitude	8	.809
Belief	5	.764
Perceived usefulness	8	.840
Perceived ease of use	6	.919
Compatibility	6	.771
Job relevance	4	.782
Subjective norms	8	.843

*Does not exceed .700

According to the Ministry of Sports and Youth in Malaysia, youth in Malaysia are those whose age ranges from 15 to 40 years old.

A reliability test was performed to measure the reliability of each of the items included in the instrument. Within this reliability analysis, the demographic section was excluded, as was the part relating to knowledge on GPS usage, as these parts contained only closed-ended questions. In general, the reliability analysis was performed on three parts: readiness (.869), problems (.794) and behavioral aspects (.931), which all exceeded the value of .700

recommended by Nunnally (1978), thus demonstrating the strength of these parts in terms of reliability. However, further analyses looked specifically at each sub-part included, and the Cronbach's alpha value for the four sub-parts of readiness (infrastructure), problems (agency), problems (individual), and problems (technology) did not exceed the recommended value of .700 (Table 2).

4. Discussions

Fifth phase of instrument development (strengthening the instrument)

To further strengthen the instrument, a number of modifications were needed, particularly in relation to the sub-parts that did not exceed the recommended value of .700. Further analyses were conducted in order to enhance the Cronbach's alpha value of each sub-part by deleting certain items. As shown in Table 3, to enhance the Cronbach's alpha value of readiness (infrastructure), item 3 needed to be excluded, while for problems (agency), item 3 needed to be excluded in order to push the Cronbach's alpha value to exceed .700. For problems (individual), item 7 needed to be excluded, while for problems (technology), item 2 needed to be excluded.

Table 3: Cronbach's alpha value if items are deleted

Readiness (Infrastructure)	Cronbach's alpha value
Item 1	.576
Item 2	.571
Item 3	.727*
Item 4	.629
Item 5	.696
Problems (agencies)	
Item 1	.564
Item 2	.515
Item 3	.705*
Item 4	.617
Item 5	.592
Item 6	.614
Problems (individual)	
Item 1	.582
Item 2	.598
Item 3	.595
Item 4	.642
Item 5	.636
Item 6	.602
Item 7	.771*
Problems (technology)	
Item 1	.680
Item 2	.718*
Item 3	.648
Item 4	.566
Item 5	.618
Item 6	.602
Item 7	.601

However, the researchers decided to exclude only one item – namely problems (technology). Two items – namely item 3 of problems (agency) and item 7 of problems (individual) – were maintained and re-phrased to further enhance respondents' understanding, while for item 3 of readiness (infrastructure), though exclusion of this item would have enhanced the Cronbach's alpha value, the researchers decided to keep it as the resulting Cronbach's alpha value of .697 is very close to the recommended value of 0.700. In addition, a number of questions were re-phrased to make them simpler and more understandable to the respondents and the enumerators. The final version of the instrument consists of five parts, namely demography information (consisting of 13 questions), knowledge on GPS usage (four sub-parts and 22 questions), readiness (four sub-parts and 20 questions), problems (four sub-parts and 25 questions) and behavioral aspects (seven sub-parts and 45 questions).

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