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PERFORMANCE ANALYSIS OF FLOOD RISKS COMMUNICATION AND ADAPTATION PROGRAM FOR FISHERMEN IN EAST-COAST MALAYSIA

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ABSTRACT

Climate information and early warnings are adjudged as key inputs for any adaptive action as such they are regularly disseminated through Information Communication Tools (ICTs) to fishing communities in Malaysia. However, such communication programs are adjudged to be top-down and expert centric, resulting in attendant unpreparedness and maladaptive attitude. As such the input of beneficiaries is clearly essential, the Importance-Performance Analysis (IPA) extends a simple and effective means of evaluating such services, therefore providing inputs on importance and performance of innovations. This work is guided by Protective Motivation Theory (PMT) to evaluate and highlight priorities and satisfaction ratings on flood risks communication, revealing specific clients' needs for effective communication towards resilient livelihood in a participatory manner. Data was collected from 362 fishermen in east coast Malaysia and results of analysis revealed high perceived importance ratings on issues like severity and vulnerability to flooding events and low ranking in performance of advisory services to flood risks communication. Findings will, therefore, inform design and or improvement of programs by government agencies and NGOs.

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INTRODUCTION

Climate change has brought about incessant extreme events like floods, tsunamis and other weather-related disasters across the world. Southeast Asia is especially mentioned as vulnerable to events like flood. Countries like Malaysia are continuously affected by flood incidence year in and out. This is known to affect agricultural livelihood directly, food security and general livelihood resilience of agricultural communities (FAO, 2016). Adaptation as a social dimension pathway to reduce risks of the climate-

related event is adjudged to rely on the effectiveness of information communicated. Conversely, such information on risks, mitigation and adaptation strategies are provided as essential alleyway to being resilient for sustainable development within agricultural communities (Haer, Botzen, & Aerts, 2016; Pitrenaitė-Žilėnienė, Carosi, & Vallesi, 2014). Such weather-related information is extensively being relayed mainly through Information Communication Technologies (ICTs) across countries like Nigeria (Adelekan & Asiyani, 2016), Sri-Lanka

(Wickramasinghe, 2011), Malaysia (Hassan, Samah, Shaffril, & D'Silva, 2011; Khalid *et al.*, 2015) among others.

Flood and other risks reduction communication are especially important areas in agricultural extension and risk reduction, as asserted by FAO, in 2015, considering poverty, vulnerability, food insecurity is directly correlated to risks in general, with the latter being a compounding factor. Countries like Malaysia have since adopted early warning and provision of climate information to tackle flood risks and increase livelihood resilience across the agricultural livelihoods (Noorhashirin, Faiza, Mohammad, & Juni, 2016). However, flood risk reduction communications and programs in Malaysia have been linked to a procedural shortcoming, described as top-down, expert centric and responsive in approach. This practice is seen to have informed a maladaptive behaviour to the adaptation approaches and therefore unpreparedness to the flood event. This was acknowledged in the eleventh development plan that the early warning in the country has not been efficient and highly centralized (Malaysia Economic Planning Unit, 2016). In any communication for adaptation the non-inclusion of the target audiences' input has high tendency to result in maladaptive behaviour. This is reported in several countries like England, Netherland, Malaysia and France (Haer *et al.*, 2016; Koerth, Vafeidis, Hinkel, & Sterr, 2013), where the expert centric designed climate information or flood early warnings were not heeded to and thus most communities remain unprepared to such risks.

Literature have suggested such failures to react to information as attributed to factors like; perceived relevance of the information (importance), interest of the target audience, addressing felt needs and perceived prior satisfaction to similar services (Lieske, Wade, & Roness, 2014; Spialek *et al.*, 2016). Moreover, such communications that focussed on peoples' need are known to have worked in many aspects of life. An example is the advertisement industries where in products marketing, information is targeted to present solution to needs and stimulate consumers' interests (Schivinski & Dabrowski, 2015), this have been seen to be a trajectory towards acceptability of products and ideas. In this regard, information is regarded as a veritable means of stimulating action and acceptance of ideas, products and innovations.

Although researchers have established the fact that ICTs are heavily utilized by fishermen in peninsular Malaysia (Mazuki & Man, 2014; Shaffril, Omar, Hassan, Bolong, & Silva, 2012; Siti Zobidah & Chhachhar, 2012). Barely, researches are found that looked at the end-users' specific input to communication programs design. In particular, there has not been any research that seeks to assess the perception of the fishermen of coastal zones on importance and satisfaction levels to such communications. This kind of research is alluded to be a good source of an informed and effective communication model that is participatory and more acceptable (Cheng, Mitomo, Otsuka, & Jeon, 2016; Haer *et al.*, 2016).

Furthermore, in recent times the Importance Performance Analysis (IPA) have attracted the attention of researchers in agricultural extension and its potentials as a tool that will aid in the assessment of the needs and satisfaction of extension services (Warner *et al.*, 2016). It, therefore, becomes essential for fact-finding to inform policies and subsequent integration of the felt needs of the clientele and their discovered needs in risks communication efforts. Also, testing the use of IPA to test its efficacy in sourcing end-users' specific input in programs designs. This is because it is recognized that when cognizance of the targeted population's needs is taken into consideration an effective communication occurs (Cheng *et al.*, 2016). This study mainly aimed to explore the perceived level of importance and performance of flood risks communication contents by fishermen, determine felt needs and satisfaction levels as measured by performance of ICTs use for designing of people-centric information service delivery in an efficient communication of risks and risk aversion actions.

Importance Performance Analysis

The Importance Performance Analysis (IPA) technique was initially developed to analyse quality attributes of products or services in the marketing discipline, based on two dimensions of importance and performance. The premise was that consumers are understood to rely on two cues in assessing products for possible patronage and utilization (Martilla & James, 1977). IPA, therefore, aimed to combine the two cues of importance (need or relevance) and performance (satisfaction/utility) of a product by consumers. This is then integrated into a matrix that highlight priorities

that would inform strategies for improvement. The result of the analysis point to the perceived need, relevance or priorities of the consumer as well as their satisfaction when they use the products. It further presents a box matrix as a guide to pictorially present the findings to managers for easier interpretation. Owing to its success on advertisement of commercial products, the IPA is seen to hold great potential in the field of advisory service and public health. This is for the fact that both are involved in the promotion of ideas, innovations or behaviour (Chu & Choi, 2000; Warner *et al.*, 2016).

The IPA technique combines measures of perceived performance/satisfaction of respondents and presents them into dimensional plots that aids the interpretation of output from the analysis (Martilla & James, 1977). The plots are categorized into four quadrants and each of the quadrants represent level of priority and satisfaction of a service or activity. The first quadrant labelled Q1 represent high priority area with less satisfaction by the clientele. As such actions

need to be concentrated on issues that appear within it. It, therefore, can inform the use of all available resources to tackle these issues, this is because they are of high importance to the target population and they have a low satisfaction by the service delivery. Q2: represent keep up the good work, indicates items that fall within here are of high importance and the performance is satisfactorily, hence service delivery should be maintained because it is of high importance to the respondents. The level of resource allocation should also be maintained, any further increase is unnecessary. Q3 represents Low priority issues, any items that fall within this quadrant are of low importance and are of low satisfaction as perceived by the respondents, it suggests possible adjustment in allocation of resources to more pressing needs in the other quadrants of relevance. Q4 the last quadrants indicate an effort that is long satisfied and continued investment is just a waste and possible overkill, this is because despite satisfactory performance it is of low importance to the recipients.

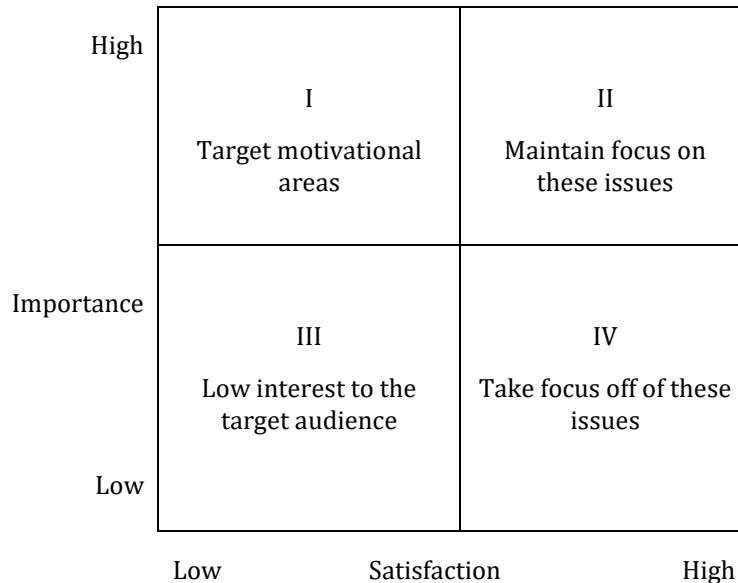


Figure 1. The Importance Performance Matrix Box and Source: (Warner *et al.*, 2016).

Theoretical Background

The Protective Motivation Theory (PMT) forms the theoretical perspective of this work, being reputed as an excellent theory in understanding the effect of communication on the adaptation and preparedness behaviour of people. It was used by different researchers to assess the effect of communication on protective measure against natural disasters, agricultural risks,

poverty, sea-level rise and health risks (Block & Keller, 1998; Fox-Rogers, Devitt, O'Neill, Brereton, & Clinch, 2016; Koerth *et al.*, 2013; Martin, Bender, & Raish, 2007; Oladele, 2013). In the PMT it is understood that when information is relayed, it activates cognitive processes of appraising the threat and coping capabilities of the recipient. The result of the appraisal will inform the recipients adaptive or maladaptive behaviour and

therefore accepting or discarding the information (Block & Keller, 1998; Cheng *et al.*, 2016; Xiao *et al.*, 2014). It, therefore, highlights the importance of the cognitive state for any communication expert. The main content of the message, therefore, is an important vehicle to this phase of these appraisals which would determine the adaptive action or otherwise. The fact that the IPA has been especially recommended for use in the communication aspect of agricultural extension (Chaudhary & Warner, 2016; Feng, Mangan, Wong, Xu, & Lalwani, 2014; Warner & Chaudhary, 2016) made it appropriate therefore to base the work on a grounded communication theory like PMT. This research, therefore, chose the PMT and used its constructs to develop scales for assessing the importance-performance analysis of the need of the respondents in flood risks communication. These constructs are severity, vulnerability, response efficacy and self-efficacy.

METHODOLOGY

The research adopted a cross-sectional method of gathering data and a structured questionnaire was developed in English language and translated back and forth from English to Malay language for easier and intended understanding by the respondents who are mainly Malay. Three independent professional translators were utilized, that are proficient in the two languages. A double-entry protocol was adopted to ensure minimal entry errors, discrepancies were corrected from this process. Items developed based on the Protective Motivation Theory (PMT) were used to collect the data for perceived vulnerability, severity, response efficacy and self-efficacy. Items were measured using a five Likert scale designed as 1=Not very important through and 5=Very important. On the other hand, items were developed to capture the performance as well which is viewed as satisfaction, since a high rating in performance means high level of satisfaction. The scales for satisfaction were measured with 1=Highly Dissatisfied to 5=Highly Satisfied. This is to

measure whether the kind of information they require and regard as important, are adequately provided and has met their expectations. The research population are the fishermen of the east coast Malaysia, and the states of Terengganu, Pahang and Kelantan. The Krejcie and Morgan Method were used in which the sample size was calculated based on the number of registered fishermen provided by the Department of Fisheries (DOF) which was 17,212 (Department of Fisheries Malaysia, 2015). A sample of 380 respondents was determined for the study. The Performance evaluation matrix used in the study is used to analyze the importance and performance analysis (IPA) of the statements measured using means and the IPA presents the results in a pictorial representation dispersed across for quadrants of boxes. These boxes indicate the level of ratings the respondents attached to each statement's importance and satisfaction level. Similar approach was used by (Chaudhary & Warner, 2016) to measure extension clients need America.

RESULTS AND DISCUSSION

Table 1 shows that the majority (83.1%) of the fishermen are married and fall in moderate-income level (RM600-1000). This shows majority of the fishermen earn within range of Malaysian Economic Planning Unit prescribed poverty line of RM 720 which is equivalent to \$167 monthly income (Yusof, Kamaruddin, Omar, Bolong, & Shaffril, 2014). 39.2 percent of the fishermen are between the age range of 48-62, which is quite reflective of an ageing population as hinted by (Mazuki & Man, 2014) that the fishing industry in Malaysia is faced with an ageing population. Respondents were mostly with education up to primary level 63.3 percent with very few having diploma and above 3.6 percent. The years of experience are mostly in the range of 14-28 years. The findings of the socio-economic characteristics of fishermen, reported in Table 1 are at par with what was reported by (Meng *et al.*, 2014) in their work on ICTs usage by fishermen in Malaysia.

Table 1. Socio-economic Characteristics of Fishermen in East Coast Malaysia.

| Variables | Frequency | Percentage |
|----------------|-----------|------------|
| Age Categories | | |
| 19-32 | 82 | 22.7 |
| 33-47 | 116 | 32.0 |
| 48-62 | 142 | 39.2 |
| 63-77 | 22 | 6.1 |

| Education | | |
|-------------------------------|-----|------|
| Primary | 229 | 63.3 |
| Secondary (SPM) | 105 | 29.0 |
| Diploma and Above | 13 | 3.6 |
| Pondok (Islamic based system) | 15 | 4.1 |
| Marital Status | | |
| Single | 51 | 14.1 |
| Married | 301 | 83.1 |
| Widowed | 8 | 2.2 |
| Divorced | 2 | 0.6 |
| Fishing experience | | |
| 1-13 Years | 118 | 32.6 |
| 14-28 Years | 125 | 34.5 |
| 29-43 Years | 95 | 26.2 |
| 44-58 Years | 24 | 6.6 |
| Income categories (RM) | | |
| 200-599 | 26 | 7.2 |
| 600-999 | 157 | 43.4 |
| 1000-1399 | 131 | 36.2 |
| 1400-1800 | 48 | 13.3 |

Table 2 reveals overall importance ratings as having high mean values between 4.27 to 3.80 which shows the level of importance the respondents attach to these statements. Similarly, the statements measuring satisfaction have high mean values between 4.54-4.14 indicating a high level of satisfaction. Fig. 1 depicts a division of four (4) quadrants that present pictorial image of the perceived importance and satisfaction statements of the fishermen as informed by the flood risk communication issued. These Quadrants revealed perceived importance and performance of communication in terms of frequency of issuance and message contents.

First quadrant labelled "A" revealed that the information accessed by the fishermen measured on scales of Severity "SEV2" with statement "I am reminded through ICTs of the effect of flood risks" are perceived to be very important but poorly communicated, thus rated low in satisfaction. Quadrant "B" revealed scales that measured "SEV 1" with statement "Through ICTs use I am reminded of the severity of Flood event and therefore I never forget of how severe it could be on my life and livelihood", "SEV 3" with statement "I am always reminded that people that refuse to prepare are the most severely affected through ICTs" and "SEV4" with statement "ICTs is used in flood event to rescue us and reduce severity of its effect by linking us to rescuers immediately", and "PV2" with statement "Potential risk to the properties, equipment and lives are frequently and clearly communicated by

early warning through ICTs". Also, "PV5" = *My vulnerability to Flood risks is always in my conscious due to constant reminders through ICTs*". These are all perceived to be important and are satisfactorily communicated. The Quadrant labelled "C" indicate scales REF2 with statement "ICTs use and measures of rescuers are capable of aiding flood risk aversion and loss of lives". and REF 3 with statement "ICTs enables very reliable means of reaching to victims by authorities, I, therefore, trust the system", SEF2 with statement "ICTs increase my skills and knowledge level, therefore, my capacity to reduce risk and save lives" and SEF 4 with statement "The use of ICTs ensures smooth call for help reliably and empower me to save myself" as being rated low in importance and being poorly provided hence low satisfaction. While the last quadrant "D" is seen to reveal a REF4 with statement "ICTs facilitate knowledge and sharing of experience, therefore, I am capable of averting flood risks", SEF1 with statement "ICTs significantly improve my preparedness level and made me confident to take action" and SEF 3 with statement "With the skills I have through series of drills and simulation I am capable of saving myself and properties form flood risks" has been well communicated. However, the fishermen perceive it to be not important. These results show that for the first quadrant the respondents feel that communication emphasizing the severity of flood consequences should be intensified and repeated frequently, this is because it is rated as important but poorly communicated.

The second Quadrant indicates that the respondents perceive that messages that reminds them of their vulnerability as communicated satisfactorily. Nonetheless, they feel it should be sustained and made richer in content. Quadrant C is seen as of less

importance because it basically tells them of their capability to save themselves and also highlight the availability of rescuers around them, but communication is unsatisfactorily, this means such information should be communicated effectually.

Table 2. Fishermen Perception of Importance and Satisfaction of ICTs Use for Flood Risk Communication.

| PMT Scales | Statements | Mean of Importance Rating | Mean of Satisfaction Ratings |
|--------------------------|--|---------------------------|------------------------------|
| Vulnerability | | | |
| PV1 | Flood risk is communicated in detail and effective manner through ICTs | 4.06 | 4.27 |
| PV2 | Potential risk to the properties, equipment and lives are frequently and clearly communicated by early warning through ICTs | 4.15 | 4.52 |
| PV3 | There is adequate and sufficient information about flood risk and its effect on life and livelihood | 4.13 | 4.32 |
| PV4 | Early warning is issued always and the need to be prepared at all time through ICTs | 4.08 | 4.32 |
| PV5 | My vulnerability to Flood risks is always in my conscious due to reminders through ICTs | 4.08 | 4.33 |
| Severity | | | |
| SEV1 | Through ICTs use I am reminded of the severity of Flood event and therefore I never forget how severe it could be on life and livelihood | 4.22 | 4.45 |
| SEV2 | I am reminded through ICTs of the effect of flood risks on physical and emotional torture it causes people | 4.23 | 4.19 |
| SEV3 | I am always reminded that people that refuse to prepare are the most severely through ICTs | 4.17 | 4.54 |
| SEV4 | ICTs are used in flood event to rescue us and reduce severity of its effect by linking us to rescuers immediately. | 4.27 | 4.38 |
| Response Efficacy | | | |
| REF1 | The skills and measures I learn through ICTs programs are good enough to reduce flood risks | 34.09 | 4.30 |
| REF2 | ICTs use and measures of rescue are capable of aiding flood risk aversion and loss of lives. | 3.95 | 4.14 |
| REF3 | ICTs enable very reliable means of reaching to victims by authorities, I, therefore, trust the system | 3.99 | 4.31 |
| REF4 | ICTs facilitate knowledge and sharing of experience; therefore, I am capable of averting flood risks | 3.98 | 4.44 |
| Self-Efficacy | | | |
| SEF1 | ICTs significantly improve my preparedness level and made me confident to | 3.87 | 4.33 |
| SEF2 | ICTs increase my skills and knowledge level, therefore, my capacity to reduce risk and save lives | 3.80 | 4.19 |
| SEF3 | With the skills, I have through series of drills and simulation I am capable of saving myself and properties form flood risks | 3.90 | 4.41 |
| SEF4 | The use of ICTs ensures smooth call for help it is very reliable and empower me to save myself | 3.93 | 4.18 |

While the last quadrant 'D' talks about aspects of response efficacy and self-efficacy which is also perceived to be done satisfactorily but over rated. Perhaps, expert may have identified as important thus constituting to what is termed as unfelt need in extension. The implication is that for the unfelt discovered the message content and manner of dissemination should be enhanced to highlight those elements with an aim of provoking feelings of its relevance to their livelihoods.

Table 3 & 4 reveals the levels of perception of importance and performance of the fishermen on the

flood risk communication through ICTs. It shows that the use of ICTs for this kind of communication was highly important, as it ensures real-time information and wider coverage but the average level of performance and therefore satisfaction is seen to be medium. This reveals the possibility of underperformance of the communication process or the presence of noise that may have blocked the information. This may have been the cause of the asserted unsatisfactory communication services by agricultural communities in Malaysia (Azril *et al.*, 2012; Hassan, Hassan, Shaffril, & d'Silva, 2009; Yusof *et al.*, 2014).

Table 3. Level of Perceived Importance of ICTs Use for Flood Risk Communication of Fishermen.

| Level | Frequency | Percentage |
|--------|-----------|------------|
| Low | 26 | 7.2 |
| Medium | 99 | 27.3 |
| High | 237 | 65.5 |
| Total | 362 | 100.0 |

Table 4. Level of Perceived Satisfaction of Content and Frequency ICTs based Flood Risk Communication by Fishermen.

| Level | Frequency | Percentage |
|--------|-----------|------------|
| Low | 33 | 9.1 |
| Medium | 234 | 64.6 |
| High | 95 | 26.2 |
| Total | 362 | 100 |

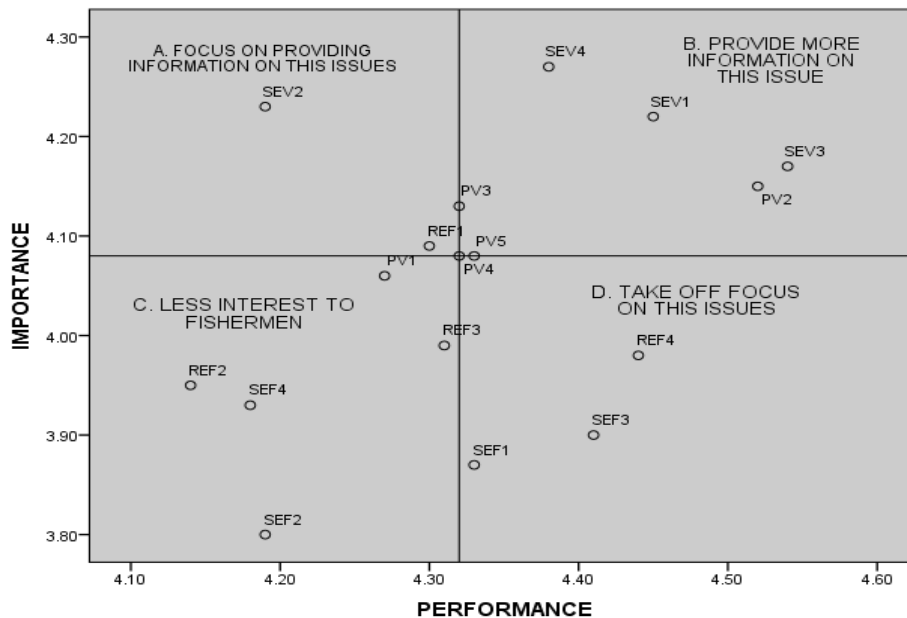


Figure 2. Importance-Performance Matrix Box of ICTs based Communication Contents and Ratings.

CONCLUSION AND RECOMMENDATIONS

The study reveals a high perceived level of importance of ICTs use on flood risk communication while showing an expressed medium level of performance or satisfaction of the use of ICTs for communication. It also, applied the IPA method of analysis to assess the importance and performance of ICTs for flood risk communication. The results revealed salient issues that are perceived to be of high importance to the fishermen, issues like the content of the flood risk communication, highlighting specifically the need to improve on some issues like communicating the level of severity of flood risk to elicit preparedness action. Specific messages on severity were shown to be not properly communicated as such the respondents rated them as unsatisfactorily. Scales on self-efficacy and response efficacy were rated not so important to respondents but still could be communicated better. The implication of this findings is that frequent and clear early warning of flood risks on severity should be issued, a thought evoking communication of the people's vulnerability and severity of the flood risk need to be loaded in every message issued out. The respondents feel flood risks communications that are laden with severity of flood risks could be as highly important. While communications that show how well the government has provided buffers and therefore response efficacy and self-efficacy to flood event as making them take less adaptive measure. Nonetheless, it is indicated that government had done a satisfactory job in this area, suggesting a waste of resource and lack of priority to concentrate on them. The main implication is that since they are not satisfied with services the action that was expected will not be realized. Hence, based on the findings it shows the noise that blocks the effect of communication, like in consideration to people's opinion and implementation of expert centric policies. The perception revealed here within would make program designers, policymakers to focus on the severity and vulnerability and less of response efficacy of the fishermen and agencies respectively while issuing such communications. A well planned, articulated and psychological arousing communication with a well-researched message content should be designed when issuing flood risk communication.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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