Consumer's Confidential Level for Evaluating New Innovative System for Safety Consumed Shrimp by Structural Equation Modeling (SEM)

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ABSTRACT

Consumer's behavior is the main subject that use for predict the purchasing behavior in Marketing strategic management. Safety's awareness of consumer is the main attribute, especially concern on raw shrimp from conventional production system that creates a lot of problem such as toxic residual from antibiotic, disease. Then food safety's awareness is related to buying deciding process. Brand new technology has limited to apply for shrimp farming business, aim to find the key attribute to launch the new innovative products. The acceptance of consumers would support adoption process of all parties in this value chain. The research shows the safety is the parameter that's dominated safety's awareness, interesting till evaluated stage. The researcher took the structural equation modeling (SEM) to proof hypothesizes and explained the consumer behavior

Keywords: *Structural Equation Modeling (SEM), Consumer's behavior*
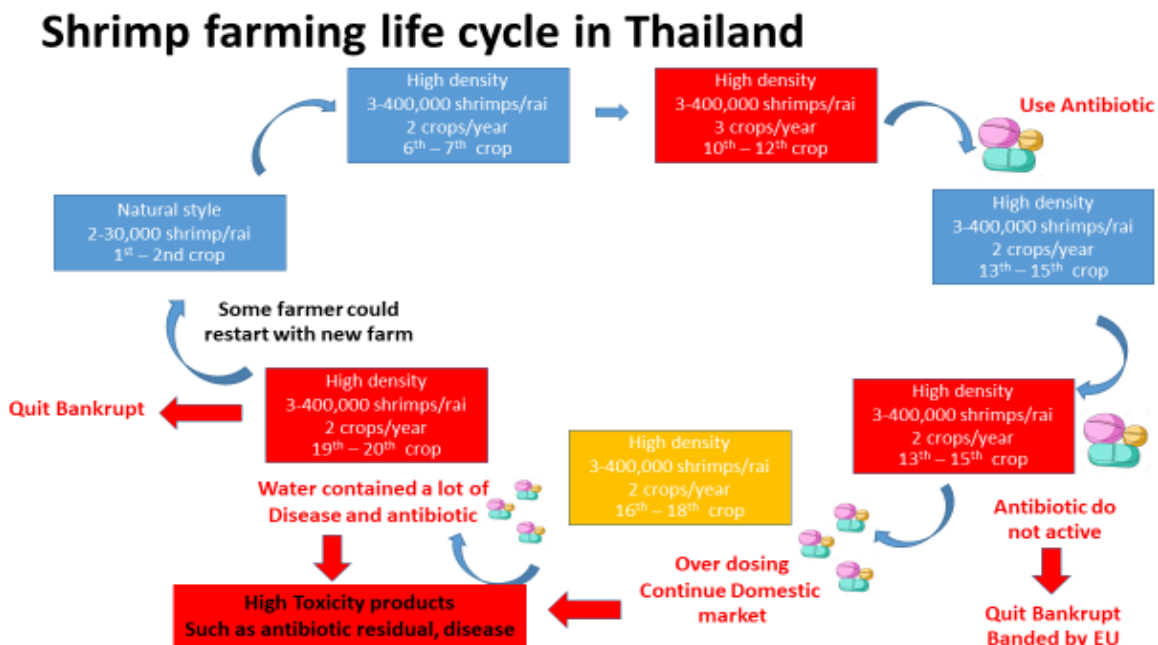
1. INTRODUCTION

Food is the fundamental needs for the human being and organism. So "food safety" attribute is the key concern. Safely in food production systems always optimizes issue in developing country. Safety always be concerned and compared with high productivity process. The concern of climate's change has studied toward with food scarcity, is the main reason from unbalance situation of population's growth and food supply system. "How can the industry survive during the climate change and growth of population in globe?" Productive system is the one option of fishery industry, control water system, genetic food, and developed feeding solutions. Therefore, shrimp farming industry

and Shrimp's value-added chain and its derivative have become a big market for consuming food. South East Asia shrimp production has stable operation after has faced with disaster with white shrimp and black tiger shrimp. While the shrimp global demand has been gradually increased since last decade. Mainly past research that's studied about the food safety and consumer confidential level in consumed food products, has compared in many dimensions, such as supply chain side, logistic, toxicity of residual. In fishery business, the consumer perception in shrimp widely spreads in many segmentations with the different types of shrimps, have matched with customer demand. Consumers qualified values of shrimp by expense in each meal while do not know the exact sources of shrimp's production. During last 3 decades, show the effect of non-qualify method to increase productivity. And still facing complex problems such as residue of antibiotic, disease from adaptation of biological organism etc. 2012, Janneke de Jonge, Hans van Trijp *et al.* had studied about consumer confidence in the Safety of Food, group of researcher found about 2 groups of consumer optimism and pessimism in Netherland. The results show both groups of customer concerned on products under controlled by regulation and actors in food chain. The result show the confidential level of Dutch consumers, that's living in developed country. European union regulatory institutions have been installed in Europe to more effectively manage food hazards, due to this region have net import food and agricultural from Asia, Jelle Bruinsma 2012. The information brought the researcher to study deeply in area of main production of shrimp and fishery. How is consumer in Thailand confidence in products from Asian countries those supply shrimp and prawn nowadays? In this region fishery and shrimp farming industry increases productivity without well control

system, toxicity from residual matter, reflection by banding product from developing countries. With the significant control level products from Thailand have under watching from EU regulatory officer, which has six months to take measures or face a EU ban of its products.https://euobserver.com/eu-asean/128402.

Researcher chose the main target customer in Thailand that's have the same context as in consumer in developed country. By choosing criteria from education and high-level expense and high salary level and education. Confidence is based on familiarity (Siegrist *et al.*, 2003), and develops from the integrated of their positive experiences. However, when established expectations are compromised as always (Hansen *et al.*, 2003). Consumer confidence in the safety of food can be accompanied by general affect or emotions. The importance of affect for making judgments has also been stressed by Loewenstein *et al.* (2001) and 2012, Janneke de Jonge, Hans van Trijp *et al*. In addition, previous studies have indicated that consumer perceptions of food-related hazards and new food technologies are often based on emotions such as worry, concern, and fear (Barnett & Breakwell, 2001; Baron *et al.*, 2000; Laros & Steenkamp, 2004; Setbon *et al.*, 2005). One of key attribute to describe the confidential level of the consumer, researcher could extent to which consumers

are confident about the product or food that's process under regularity. So trustable regulatory institutions and producers to protect consumer interests, as well as the information that these institutions provide about food risks (Grunert, 2002). For regulatory institutions responsible for the handling of hazards, might help consumers to verify for their lack of knowledge about the cultivation and production process of foods (Siegrist &Cvetkovich, 2000; Van Kleef *et al.*, 2006), so to avoid of the negative feedback and misunderstood, researcher apply the optional parameters that describe another way of confidential level that relate to the acceptance of new innovated system to treat the water in farming. About the alternative option to handle the supply chain by using the clean technology, researcher also describe this product and system via the current technology that well known in the parallel business area such as UV treatment, antimicrobial system by using Silver nano particle (Ag+) and ecosystem. These are the trustable keywords that apply in many product and system to control the microorganism. Trust can be characterized as relying on those with responsibility for managing public health and safety (Siegrist *et al.*, 2000). Another related topic as given information about the logistic from farming to the shrimp preparation till the area that's shrimp deliver to the consumer place.

Pic. 2 *Shrimp farming life cycle in Thailand.*

Trust of consumer in fresh food or raw material for daily consuming, the problem statement concerned about the confidential level of safety, fresh, quality of raw product. Understanding of consumer in related issued such as residual, logistic, country of origin would be the one of key concerns of focused sampling group. By this statement, researcher could scope down the key concern of consumer confidential level through their behavior and perception. To improve productivity of food supply, need to use technology adoption. Farmer or Consumer are concern in different level. We are trying to find the new proving technology but almost the big brand feed supply in Thailand always offer the technology that proved in the laboratory or sometime they try in some pilot scale. Mr. Damrong Supasiriphoca. The developed technology need to proof and proof in many level, laboratory, pilot scale and commercial scales. While these systems would support improving productivity and low toxicity. To communicate the innovative product or new product development (NPD) through the theory of diffusion and adoption by Everett Roger since 1995. The key management process is water treatment system without using the chemicals treatment. Consumer can be confidence to have the shrimp with high standard of low concentration of Antibiotic medicine. While the innovative system could call as the green process for feeding shrimp and prawn. This innovative system is called competitive advantage for the organization. The name of components of the system as described above are UV, Silver particle, both are well known technique to use in controlled microorganism. Linlin Wang,[1,*] Chen Hu,[2,*] and Longquan Shao[2] have studied for the mechanism of silver particle have methodology to control bacteria, by the silver particle or Ag+ will destroy the surface area of microorganism then cell wall will be destroyed and microorganism would be destroy too. The techniques almost the same way, At certain wavelengths, UV is mutagenic to bacteria, viruses and other microorganisms .Particularly at wavelengths around 270–260nm, UV breaks molecular bonds within microorganism DNA, producing thymine dimers that can kill or disable the organisms, *https://en.wikipedia.org/wiki/Ultraviolet_germicidal_irradiation*. With this implication techniques, they using 2 mythologies to build competitive advantage. Researcher need to find the right business model for the right market segmentation. By the adoption process, we choose the initial states of adoption through awareness attribute and interest attribute. To convince the early adopter such as farming system in Thailand, researcher could study the perception of high-end consumer in quality of shrimp. Some aspect would have the correlation between reliability of consumed shrimp

compare with the understanding about source of shrimp from domestic or import compare with unknown source. The understanding of disease such as EMS, white feces, blue symptom and understanding of toxicity from residual after harvesting such as residual of antibiotic, cleaning agent. Again, those group of consumers who decide as high-end group who could spend money for each meal as high level. This group has the high income compare with European sector. The acceptance of consumer in outcome of new technologies would be one of stepping stone for setup criteria for future research to adopt the new technology in farming system. To study about the adoption the new technology to farming system through the perception of consumer in safety and reliability in shrimp that's they consume frequently. This research would be supported for the early adopted group to understand and accept for the step into the trail process.

2. RESEARCH PROBLEMS

1. Does Reliability factors in shrimp supply chain effect to the safety's awareness of consuming shrimp or not in consumer sector?
2. Does sources of shrimp be concerned factors in effect to the safety's awareness of consuming shrimp or not in consumer sector?
3. Does Personal preferable in shrimp effect to the safety's awareness of consuming shrimp or not in consumer sector?
4. Does current satisfaction on consumed shrimp effect to interesting in new innovated system for water treatment in shrimp farming or not in consumer sector?
5. Dose safety's awareness in current shrimp supply chain effect to interest in new innovated system for water treatment in shrimp farming or not in consumer sector?
6. Does consumer interest in new innovated system for water treatment in shrimp farming effect to evaluated process of consumer or not and how does impact for evaluation in consumer sector?

3. RESEARCH OBJECTIVES

1. To study reliability factors in shrimp supply chain effect to the safety's awareness of consuming shrimp or not in consumer sector.
2. To study sources of shrimp be concerned factors in effect to the safety's awareness of consuming shrimp or not in consumer sector.
3. To study Personal preferable in shrimp effect to the safety's awareness of consuming shrimp or not in consumer sector.
4. To study current satisfaction on consumed shrimp

effect to interesting in new innovated system for water treatment in shrimp farming or not in consumer sector.

5. To study safety's awareness in current shrimp supply chain effect to interested in new innovated system for water treatment in shrimp farming or not in consumer sector

6. To study consumer interested in new innovated system for water treatment in shrimp farming effect to evaluated process of consumer or not and how does impact for evaluation in consumer sector

Researcher set hypothesizes along with the research problem and research objective. By this hypothesizes researcher could use the structural equation models (SEM) to test above hypothesizes.

4. LITERATURE REVIEW

Summarize the Literature review about the effect parameters on awareness and interesting in safety attribute in food supply chain.

Table 1 : Summary of Literature reviews

Topic		Studied issue	Reference
Awareness	1	Researcher studied Italian knowledge, attitudes and related behavior on food borne diseases and food handling practices among consumers and pointed out that the people. Lack of practice and knowledge lead them to low awareness on food handling both Man and Woman, those needed educational programs and counseling by physicians to adopt hygienic food handling practices.	Angelillo et al., (2001)
	2	Researchers have emphasized that "risk is a collective construct" accumulate and complex between fear, aware, trust in constructive ways	Douglas and Wildavsky 1982
	3	Researchers have found the attention to local television had an awareness of food safety problems and perceived safety of local food supply were statistically controlled. Other important predictors included gender, education, ethnicity, and perceived safety of local food supply	Kenneth Fleming,Esther Thorson,Yuyan Zhang 2007

	4	Researcher found, automatic purchasing, new products may simply not be perceived by consumers. It may take a special marketing effort, such as in-store displays, free samples to break through the barriers of habitual behavior and make consumers aware that a new product with an improved quality exists.	Klaus G. Grunert 2005
Safety attribute	5	Consumer confidential level, related to newspaper coverage in food safety news. Researchers found recall products' rate relate directly to news from newspaper and other media significantly.	Janneke de Jonge,1,∗ Hans Van Trijp,1 Reint Jan Renes,2 and Lynn J. Frewer1, 2010
	6	Researcher found four determinants of general consumer confidence in the safety of food, Regulators and actors could influence in the food chain, perceived safety of product groups, Recall of food safety incidents show the significant related confidential level in food safety and individual differences.	de Jonge et al.(4)
	7	Researchers found the news media inform the public about food, safety, nutrition, and other health issues much more ably than public health professionals such as registered dietitians, physicians, or nurses, actors	Borra et al., 1998; Hampl,2004
	8	Consumer trust in the reliability sources such as regulators, producers, and distributors responsible for the management of hazards. Because trust enables consumers to compensate for the lack of knowledge about the safety of food they eat.(17−19)	Janneke de Jonge,1,∗ Hans Van Trijp,1 Reint Jan Renes,2 and Lynn J. Frewer1, 2010

	9	Researcher found knowledge and practice among food handlers toward safe food preparation. Moreover, this questionnaire covers important aspects needed to be emphasized in preparation of safe food served to school children and suitable for measuring the changes associated with intervention work aimed at improving the knowledge and practice level among food handlers.	Nik Rosmawati et al. 2015
	10	Food safety is influenced customer's mindset satisfaction and its relation becomes more effective if source of information is reliable	(Frewer and Miles, 2001)
		Overestimate sales plan is related to the failure of new product selling in launching period	Lindroos 2006
	11	Researchers found behavior toward a risk-related crisis (such as food safety) is driven by different factors for different segments and that the relative influence of these variables depends on the accuracy of knowing the probability that the risky event occurs.	Joost M.E. Pennings a,b,*, Brian Wansink a,b, Matthew T.G. Meulenbergb
	12	Consumer satisfaction has directly related to their continuing purchase of the same products. It is in consumer's interest, therefore, to establish and administer the controls that ensure that their products do indeed meet consumer expectations of safety and quality.	Sherwin Gardner ,1993
	13	Researchers found the positive correlation between the quality of a food product and the reason for its purchase, have identified a close relationship.	Keningham, Aksoy, Perkins-Munn, & Vavra, 2005

	14	Researchers found in recently year, consumers gave the priority for an assurance of higher quality, that's could recall typical product that would not match to clarified quality. To see this aspect as a distinctive feature associated with satisfaction	Mattiacci & Vignali, 2004
	15	Researcher found the interest shown by consumers in the origin and place of production of food has grown especially about European Quality Food Certification. European context verifies as income, education, expense.	Aprile, Caputo, & Nayga, 2012 and Dimara & Skuras, 2003
	16	Researcher found, price still be the most important parameter in determining consumer food choice. Interest in quality and safety improvements is often not widespread. However, one should be cautious about such conclusions for two reasons.	Klaus G. Grunert 2005
	17	There has therefore been a considerable interest in methods and concepts for consumer-oriented food product development, methods that make it easier for producers to listen to Food quality and safety 385 and understand the voice of the customer	(Biemans and Harmsen, 1995; Benner et al., 2003).
	18	Consumer interest has increased after the introduction of EU regulations on protected designations of origin (PDO) and protected geographical indications (PGI). In terms of consumer behavior, such information is a special case of country-of-origin cues, which have been subject to comprehensive research for several decades	(Verlegh and Steenkamp, 1999

After researcher studied and reviewed literature, to understand the magnitude of impact of attributes those related to initial point for adoption process. 4 keys attributes would be chosen for study 1. Food safety 2. Reliability of sources of supply chain 3 awareness in negative news 4. Interested in new technology for clean products. Safety would be defined by country of origin, farming site, Aprile, Caputo, & Nayga, 2012 studied by factor analysis, researcher study about the correlation of

each component that's related to food safety attribute such as country of origin, Toxicity from residual, Diseases. Kenneth Fleming, Esther Thorson, Yuyan Zhang 2007 have found the attention to local television had ***food safety's awareness*** problems and perceived safety of local food supply. Second component between customer satisfactions on current products the average customer satisfaction composes of Fresh product, Cleanness, Taste of product. The third factor is Reliability on existing supply chain such as farming system, separation process, delivery process, refrigerator system. Then researcher studied about the ***Reliability*** on supply chain with ***awareness***. Then study the correlation with ***Awareness*** and ***interesting*** in the information and ready to ***evaluate in new innovation products*** to supply the safety shrimp such as UV treatment, Silver-nano antibacterial, Eco-system. Researcher expected outcome, will be magnitude of readiness for evaluation. Researcher applied the SEM technic to verify the correlation and magnitude of each parameters. Outcome would show about the important magnitude of key parameters to effect consumer evaluate the new innovative systems.

5. CONDITION FOR TESTING

Researcher chose sampling size from people who come to new seafood restaurant in Rama 9 road area. The sampling size is 405 samples to verify the theoretical by questionnaire. By this number, researcher can use Cronbach's alpha to test the multi correlation. Questionnaire was test under Cronbach's alpha and cut 5 questions to maintain alpha coefficient's level above 0.8

6. DATA ANALYSIS

The data show the groups of samples from 30-49 years old took part 77.5%, while younger age was 15.6% and elder than this group 6.9%. Comparative income with European minimum income per day show the high than comparative income is 44.4% and lower than comparative income is 55.6%. European context verifies as income, education, expense (Dimara & Skuras, 2003). For the food safety attribute show the significant between education, concerned on disease and type of shrimp by F-Test. Lavene's test for safety attributed show 0.004 and 2 tails also show significant 0.011. For check SEM model fit results show after

modified, Model fit was assessed on the basis of the CMIN/DF and the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the non-normed fit index (NNFI). should be insignificant; however, as sample size influences the value (Schermelleh-Engel *et al.*, 2003), this research show an indication of the goodness-of-fit, the ratio CMIN/DF 2.7155 and acceptable fit model should be between 2 (good fit) and 3. For the RMSEA is 0.0652, values below 0.08 indicate a reasonable fit, and values below 0.05 indicate a close fit of the model to the data (see Baumgartner & Homburg, 1996). The CFI and the NNFI range from 0 to 1, and higher values (>0.9) indicate better model fit, the values are 0.8997 and 0.8513 respectively.

Table 2 *Test result of Reliability Coefficient's level (Cronbach's alpha)*

Reliability Statistics

Cronbach's Alpha	N of Items
.820	23

Item-Total Statistics

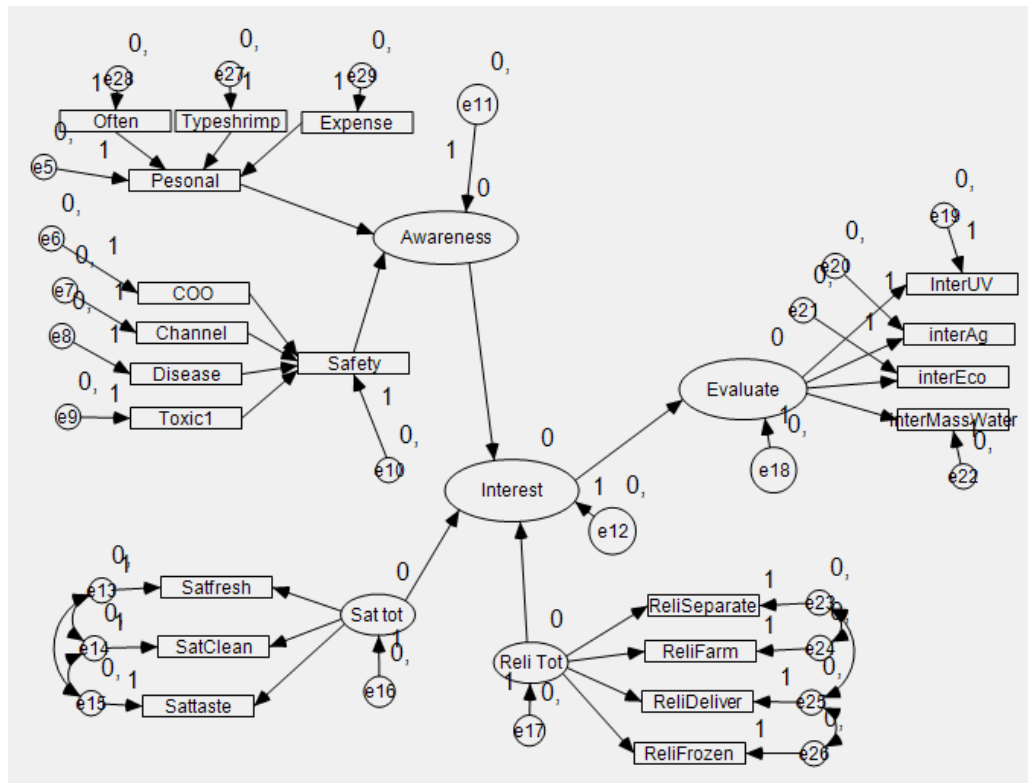|	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
interwaterM	72.1058	67.315	.410	.812
interEco	72.0758	67.728	.382	.813
interSilve	72.2858	67.021	.397	.813
interUV	72.4558	67.115	.396	.813
Reliave	73.0833	66.281	.684	.800
relirefri	73.0758	66.642	.609	.803
relideliver	73.1458	66.044	.630	.801
reliseparate	73.0758	66.973	.572	.804
relisystem	72.7558	66.852	.498	.807
Satave	72.4725	69.159	.568	.808
Sattot	72.3558	69.419	.425	.811
Sattaste	72.3058	68.833	.510	.808
SatClean	72.5958	69.818	.409	.812
Satfresh	72.5158	69.239	.473	.810
Toxic1	74.6758	75.563	-.053	.826
Diease	74.9558	74.481	.119	.821
Safty	71.7858	71.967	.197	.821
Pesonal	72.0458	69.450	.330	.816
Country	74.3758	75.135	-.040	.833
source	73.8258	74.403	.029	.827
Convinience	72.2858	68.779	.418	.811
PricePromo	72.2558	70.706	.231	.821
Taste	71.8158	69.622	.343	.815

Fig. 3 *show diagram after modification*

7. RESULTS

SEM show the impact and magnitude of factor analysis of Safety (Food safety) related directly to awareness with magnitude estimate at 0.9618, explained about the concerns of food safety in consumer mind set effect directly to awareness of consumer. While awareness directly effects to interest (Interest for new innovation products) and interest also effects directly to evaluation as number 0.5870 and 0.5035 respectively. The result of evaluate the new innovative products, show interested in UV water treatment, Silver nano treatment, Ecosystem and Mass water management by 0.8294 , 0.8242, 0.7696 and 0.7254 respectively. All magnitude number were positive sign. The structural model was tested the initial part of adoption process, awareness, interested in and evaluation. Then SEM estimated and investigated the relationship between food safety attribute and personal attitude via the latent variable awareness and also the satisfaction of existing product based on current experience then pass throught the evaluation products. Researcher described the products as 3 new innovative applied systems (UV, Silver Nano and Eco system) and existing common

process (Mass water management system) in the safety of shrimp production. The structural model yielded a good overall fit as CMIN/DF = 2,7155   (*p* < 0.01), RMSEA =
0.0652, CFI = 0.8997, and NNFI = 0.8513. Under these number, show consumers concern on food safety attribute is main issue effected to consumer awareness. While direct effect from existing consumer 'satisfaction current product effects only 0.3121 by magnitude, then main effect still be the awareness from safety attributes as 0.5626 by magnitude. Through the attribute of evaluation process was main direct effect from interest attribute. From the number, researcher found the other important factor that's consumer interested in the innovative products are UV and Silver Nano process as 0.8892 and 0.8924 respectively.

8. DISCUSSION

The research objective aims to study the key attributes could affect to consumer acceptance in shrimp products from new innovative systems. By studying the beginning step of adoption process from awareness to interest then evaluate. Safety's awareness of consumer is

the main attribute that effect in this process. Safety's awareness concern mainly raw shrimp that get from many sources. But researcher quite wonder about the attributes of Toxic residual and Shrimp's disease, researcher looked into the data and found, consumers mainly did not know about these issues. That's difference from other developed country as in European Union, consumer's awareness about public news coverage when some disease had announced **Halkier & Holm, 2006 and O'Rourke, 2001**. On the other hands, consumer that's perceived and had safety's awareness is direct interesting even impact higher than satisfaction on current attitude. This is directly affected to the evaluation process in new innovative systems.

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