

## The Relationship between Industry Strategy, Regulation and Attitude towards Genetically Modified Food among Malaysian Food Manufacturers

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**Abstract:** There is no denying that the remaining of industry in the current competitive and complexity global market led by the acceptance of industry towards latest technology. Hence, Genetically Modified Food (GMF) or known as food biotechnology is a latest technology in Malaysia which has been manufactured through the method of modern genetic engineering. Gathering response from Malaysian industry which emphasized on food sector is an advantageous means of gaining fruitful information on acceptance of GMF among food industries. Therefore, the main aim of this study is to explore the GMF acceptance among Malaysian food manufacturers. Empirical data was collected in the planned quantitative survey of 248 processed food industries in Malaysia. The finding revealed that implementation or support of proper strategy leading an increment of GMF acceptance in the food industry. Food industry also raised up their acceptance towards GMF through the implementation and support of systematic regulatory system. In addition, positive attitude feedback or response shown by manufacturers also boosted up food industry's acceptance towards GMF. This phenomenon matched to the institutional theory which exhibited that strategy of the industry, government's regulation as well as manufacturer's attitude contributed to the increased acceptance of GMF in the food industry.

**Key words:** Genetically modified food, genetically engineering, food industry, acceptance, attitude

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### INTRODUCTION

The remaining of Malaysian food industry in the current competitive and complexity global market led by the acceptance of those industries towards latest technology, in which affected by continuous transformation of industry's environment, market openness, dynamic and diverse demand of customers instead of intensified competition pressure emergence in the industry (Rudder *et al.*, 2001). Thus, GMF is a latest technology in Malaysia, also known as food biotechnology which has been manufactured through the modern genetic engineering method. Due to GMF acceptance among food industries as portion of latest technology, it has contributed to sales revenue of 53.5 billion in 2015 which resembles to 4% of annual percentage changes to Malaysia's gross domestic product in the previous year of 2014. In the same vein, total merchandise export as well as index of Malaysia's industrial production were respectively increased 58.9 billion and 5.2%. Through the acceptance of latest GMF technology, comes many benefits for the food industry. For instance, enriching nutritional and

processing food features, allocating various types of product in the production of food, boosting up the efficiency of food supplies, developing lower cost of product and also creating lower production cost inclusion of product development (Bredahl, 1999; Ceccoli and Hixon, 2012; Ellahi, 1994; Wesseler *et al.*, 2011).

However, there was an issue emerged when certain food industries shows their tendency to be reluctant and unsure while accepting GMF commercialization and usage in their food production which caused by several circumstances (Bennett *et al.*, 2013). Firstly, in respect of Malaysian stakeholders which emphasized on food manufacturers, commencement and development of GMF acceptance is still in its infancy stage at this recent market of Malaysia. Such facts shown that Food Act which is related to GMF just revised on 8 July 2010 meanwhile, the regulation concerning on GMF was enforced on 8 July 2012 by the Malaysian Ministry of Health (MOH). Second circumstance which led to the GMF acceptance issue was attitude reflected by the food manufacturers. Most of them were worried and sensitive towards inconsistency of perceived benefits and perceived risks which could adversely affect the distribution channel of food industry

(Adams, 2002; Costa-Font *et al.*, 2008). To exemplify that, majority food industry especially Multi-National Companies (MNCs) which came from United Kingdom, Switzerland, France and Canada have against to accept and commercialize GMF in their industries (Costa *et al.*, 2012; Gaskell *et al.*, 2006; Siipi and Launis, 2009; Vermeulen, 2004). Otherwise, food industry which was located in Japan, Taiwan, China as well as United States accept GMF (Hallman *et al.*, 2003; Ishiyama *et al.*, 2012; Marre *et al.*, 2007). In addition, high cost and risky condition because of the stringency and complexity GMF regulatory system in obtaining licensing agreement instead of meeting the standard and requirement of product development which regulated and enforced by government authorities and bodies were another challenges have to be faced by the food industry (Bauer and Gaskell, 1984; Jasanoff, 1995; Tait and Chataway, 2007; Tait and Williams, 1999).

Therefore, in order to cater with the aforementioned obstacles, the industry strategy plays a crucial role in boosting up the performance of the food industries while accepting GMF in their food production (Sharma, 1997). Nonetheless, food industry's managers voiced out that an adoption or implementation of industry strategy concerning on GMF is not a trouble-free work (Sung and Hwang, 2013). This is proven when the industry seen to be encounter with managerial challenges, whereby the new techniques followed by the management restructuring of industry are required to be designed by the industry's manager or leader (Doubleday, 2005; Levidow and Bijman, 2002). This is mainly due to industry strategy inherently relied on industry's current operation, culture, history, experience and affordability to formulate GMF strategy (Chataway and Tait, 1999; Foy, 1980). In accordance with those circumstances, although previous researchers illustrated that numerous researches pertaining to GMF have been undertaken and discussed in western countries such as United Kingdom, Australia and United States, GMF research in the perspective of Malaysia left much to be carried out (Daud, 2002; Ismail *et al.*, 2012). Simultaneously, an empirical research related to the industry acceptance of GMF is deemed necessary to be implemented in Malaysian food industry. Besides, literature related to the acceptance of GMF among food industries, industry strategy, regulation and attitude towards GMF usage and commercialization are explained in the following sections.

#### Literature review

**Industry acceptance of GMF:** Industry acceptance known as the situation which is giving a feedback on how far the potential stakeholders are willing to adopt, accept or reject

something or any new technology (Chang *et al.*, 2007). A review of previous literature indicated that numerous studies are devoted to industry acceptance elements. According to Chen and Li (2007) and Rodriguez and Salazar (2013) as well as Bredahl *et al.* (1998), industry acceptance is measured through perceived benefit and perceived risk. As supported by Siegrist (1999, 2000) and Tanaka (2004), both perceived benefit and perceived risk are the strongest elements to measure industry acceptance. For instance, Sheth (1973) and Stearns *et al.* (1995) stated that while minimizing the risk of GMF usage in industry's production, the food manufacturers are required to pay closest attention on perceived benefit such as quality and desirability of product.

In addition, Morris and Adley (2000) stated that trust is also a vital element to measure industry acceptance. Therefore, trust is separated into two constructs namely information and source of that information which both of them shall be valid and believable (Frewer *et al.*, 2003; Hunt and Frewer, 2001). As for an example, the manufacturers are not allowed to hide the risks and problems regarding GMF usage in their industry to avoid any controversies emerge which may directly cause the downturn of food industry (Von and Liew, 1999). On the other hand, industry acceptance is measured in accordance with food manufacturer's knowledge related to science and technology which emphasized on GMF. As a corollary although, there are many ways or elements in measuring industry acceptance, this study employed perceived benefit, perceived risk, trust and knowledge to measure industry acceptance towards GMF.

**Industry strategy:** The competitive global manufacturing sector has insisted industry to properly design its business strategy (Kaplan and Norton, 2001). The strategy is a paramount role in the industry but it will cause the industry facing with a tough time while formulating or developing the strategy (Stalk *et al.*, 1992). Hence, the strategy and action of the industry are affected by managerial interpretation (Daft and Weick, 1984). Managerial interpretation referred as a process taken by the manager of industry by ensuring the event and other information related to industry's environmental are in place very well (Dutton *et al.*, 1987). Managerial interpretation consists of environmental perspective namely threat and opportunity (Dutton and Duncan, 1987; Jackson and Dutton, 1988; Sharma *et al.*, 1999; Sharma, 1997). Besides, risk propensity would also affect the industry acceptance (Douglas and Wildavsky, 1982). Risk propensity defined as the inclination of industry's decision maker either to take or avoid the risk (Sitkin and Pablo, 1992). The risk propensity will

be influenced by the customer demand, current global market, price, quality, technology as well as retailer or supplier's commitment (Pablo, 1997; Sitkin and Pablo, 1992; Stearns *et al.*, 1995).

**Regulation:** The regulatory system of GMF is an imperative mechanism that has to be monitored by the government. GMF regulation which is related to the trade, manufacture and license are established and enforced purposely to ensure that the food manufacturers follow the regulations that has been designated. Nevertheless, the restriction level of GMF regulation is dependent on the dimensions such as approval process, risk assessment, labelling and traceability (Vigani and Olper, 2013). For instance, the approval process is a vital element in measuring regulation because unapproved GMF usage in market will lead to the difficulty of the industry to survive (Kothamasi and Vermeylen, 2011). Moreover, risk assessment and traceability hold a position as a strong element to measure regulation (Schilter and Constable, 2002; Vigani and Olper, 2013; Vigani *et al.*, 2012). Furthermore, Costanigro and Lusk (2014) explained that labelling also being an imperative role for the production, development and trading process of industry to measure the stringency regulation of GMF before making any acceptance into its industry's operation. This clearly shows that those measures of GMF modern biotechnology is imposing the most heavily regulated system which influence the food industry whether to accept or reject the GMF usage in their production.

**Attitude towards GMF usage:** The attitude towards GMF is defined as a positive or negative response, either it is seen useful or scary condition (Frewer *et al.*, 1997; Purchase, 2005). Hence, the attitude of GMF usage in the industry is a powerful to be explained by both positive and negative elements separately (Cacioppo *et al.*, 1997). Simultaneously, Henderson *et al.* (2007) as well as Kimenju *et al.* (2011, 2005) indicated that the manager in the food industry has a responsible to make an appropriate decision regarding purchasing, selling and utilizing of GMF in the food industry's production which will be based on their positive attitude towards GMF by looking at the safety, quality and preferences. This could be visualized when the food manufacturers in western countries such as Germany, Italy, Netherland and Greece shown their positive attitude by accepting and involving in the import and export chain of GMF (Knight *et al.*, 2008). In contrast to negative attitude towards GMF usage, Garcia (2006) and Bett *et al.* (2010) indicated the technology complexity, long term unpredictable effect, unforeseeable economic condition, emergence of health

and environmental concern, negative response from public consumers and status of unnatural GMF usage which may impede the industry's operation had caused the manufacturers rejected the GMF usage.

## MATERIALS AND METHODS

This research adopted cross-sectional survey whereby all items were measured at one or same point of time (Cooper and Schindler, 2003). The survey consists of five sections namely industry acceptance, industry strategy, regulation, attitude as well as respondents and organization's demographic. It has been distributed among food industry's managers throughout Malaysia. The rationale of choosing these respondents from a manager level because they were basically known as a people in charge or responsible to make a decision either to accept or reject the product in their industry's production (Bukhszar and Connolly, 1988; March and Sharpira, 1987; Vaimen *et al.*, 2012). A simple random sampling was used to get all population's element being selected into sample of this research. Out of 565 registered food industries, 248 food industries were chosen to answer the survey as it best suited of sample size for this research (Krejcie and Morgan, 1970). However, it was planned that before undertaking actual data collection, the survey was first pre-tested by three academicians from Universiti Utara Malaysia which was based on their industrial experience and their previous research activities in acceptance study. This was purposely to analyze the readability, accuracy of words, clearness of questions and adequacy of the items used in the questionnaire. The survey instruments in this research were adopted from prior study that had established their validity and reliability. Each item of the questionnaire was measured using 5-point-likert-scale.

## RESULTS AND DISCUSSION

**Data analysis and result:** Despite 248 questionnaires were sent out via self-administered, only 98 were completed and returned to the researcher. This phenomenon impacted to the response rate of 39.52%. Majority of the respondents are from top to middle management including senior manager and first line manager which amounted 29 and 27%, respectively. Consequently, it was matched to the target of researcher in which most of them (27%) represented from department of operation. It is also noted that those sent questionnaires were answered by the experienced respondents which was 25% of the respondents have been >4 year. In addition, 83% of the respondents had graduated from tertiary level. Moreover,

Table 1: Factor analysis and reliability

Variables	Factor loadings	Cronbach's alpha
Industry acceptance	0.573-0.879	0.761
Industry strategy	0.564-0.961	0.809
Regulation	0.679-0.932	0.696
Attitude	0.593-0.921	0.838

Table 2: Correlation analysis for GMF acceptance

Variables	Correlation coefficient	Sig. level
Industry atrategy	0.227**	0.008
Regulation	0.249*	0.015
Attitude	0.554**	0.000

\*Correlation is significant at the 0.05 level (1-tailed); \*\*Correlation is significant at the 0.01 level (1-tailed)

67% Multinational Companies (MNCs) gave feedback for this research. Throughout Malaysia, food industry in Penang was the highest state (27%) contributed in providing the result of this GMF acceptance. Prior to research findings, all gathered data was analyzed by using Statistical Package for the Social Science (SPSS) Version 23.

**Factor analysis and reliability:** Exploratory Factor Analysis (EFA) with varimax rotation was implemented in this research. As explained by Hair *et al.* (2006), clear separation of factors could be obtained through varimax rotation. Factor analysis was conducted on all independent variables and dependent variable in investigating the interconnection of each variable related to GMF acceptance. As recommended by Hair *et al.* (2006), the minimum value for each item of Measure of Sampling Adequacy (MSA) and Kaiser-Meyer Olkin (KMO) should be 0.50 whereas, the Barlett test should be significant at ( $p < 0.05$ ). Factors with eigenvalue of  $> 1.0$  would be maintained for further analysis however, factor loading would only be assigned as significant when it has achieved the acceptable value of 0.50 (Hair *et al.*, 2006). Besides, reliability analysis was carried out in order to assessed internal consistency by computing cronbach's alpha on all independent variables and dependent variable. Cronbach's alpha exceeding 0.50 claims as acceptable value and those 0.70 or greater indicated as strong reliability. As outlined in Table 1, the result of factor loadings that are between 0.564 and 0.961 as well as reliability are exhibited.

**Pearson correlation (r):** Pearson correlation (r) or known as Pearson product-moment coefficient analysis was used to examine the relationship of industry strategy, regulation as well as attitude towards GMF acceptance among Malaysian food industries. Thus, all those correlation results displayed in Table 2 and 3. Result obtained from implemented analysis revealed that industry strategy has a significant positive relationship with industry acceptance in which, there is a weak positive of ( $r = 0.227, p = 0.01$ ). The same weak positive

Table 3: Correlation analysis for GMF acceptance

Variables	Sig. level
$R^2 = 0.993$	Industry Strategy = 0.001; Regulation = 0.000; Attitude = 0.003

correlation goes to regulation and industry acceptance where r value and strength of relationship between these two variables were  $r = 0.249$  and  $p < 0.05$ . In contrast, attitude was found that has strong positive correlation with industry acceptance which was statistically significant ( $r = 0.554, p < 0.05$ ).

**Multiple Regression (MR):** Due to correlation analysis result is limited only to the relationship direction between independent and dependent variables, MR is the best analysis which recognized as an extension of bivariate correlation. The result of regression is an equation that represents the best prediction of a dependent variable from several independent variables. Thus, the following 3 exhibited the result of regression where the value of  $R^2 = 0.993$  or 99.3 % of variance. Meanwhile, the significant value of industry strategy, regulation, attitude were respectively 0.001, 0.000 and 0.003 which  $< 0.05$  ( $p < 0.05$ ). It can be seen that regulation is the best prediction for industry acceptance which was 0.00.

In regards to the result of this research, it is clearly indicated that industry strategy, regulation as well as attitude relationship impart to increase the acceptance of GMF in Malaysian food industry. Based on findings, it is proven that attitude has the strongest relationship with industry acceptance compared to industry strategy and regulation. Through positive attitude reflected by food manufacturers or producers towards commercialization and usage of GMF in their production or business operation, most of the food industry which came from developing nation and Malaysia is part of it, basically would show their supportive feedback on the use and commercialization of GMF.

The finding also exposed that industry strategy has shown direct positive relationship towards industry acceptance. There is a high possibility for GMF to be accepted, used and commercialized by the food industry when the food manufacturers or producers which emphasized on manager or leader on that particular food industry seen GMF as one of the attractive strategies that may remain their business with other competitors. Strategy plays a very important role for the GMF industry as it involving setting out industry's future that covers long term plan, policy, procedure, aim and vision. Those strategie's element is critically designed and formulated by experienced top management of the industry. With this implementation of proper strategies, it would beneficial industry in term of its business value,

operation and performance. Consequently, the retention of loyalty among existing customer, new product creation and improvement could be undertaken in the GMF industry.

In addition, regulation was inherently increases industry acceptance towards GMF such derived from the finding of this study. This clearly indicated that food industry are required to comply on the rules, procedures standards and requirements that have been endorsed and governed by government institution and related authority bodies. By complying on regulatory system included trading, manufacturing and licensing, importation and exportation transaction pertaining to GMF commercialization can be efficiently and effectively done in Malaysian food industry. As a result, there are several risks such as high cost, very long lead time of product development and complexity of product to be approved by government regulations would be avoided. It can be concluded that, although fulfilling the stringent regulation set up by the government is inevitable, it provides advantages to the food industry itself due to their work hard in producing high quality GMF as it is a priority should be given an attention.

Through the result of this study, despite industry strategy and attitude contributed to the Manufacturer's acceptance towards GMF, regulation is the major cause resulted in the acceptance of GMF among Malaysian food manufacturers.

### **CONCLUSION**

The acceptance of GMF among the food industries provide many benefits towards their business's operation and production. Surprisingly, the acceptance of GMF has triggered various controversies or problems that may badly affect the existing success and performance of the food industry. For instance, there are several issues being raised up such as industry strategy, regulation as well as attitude before proceed to GMF acceptance. Thus, this study was carried out to examine the relationship between industry strategy, regulation and attitude on industry acceptance towards GMF. In this study, the industry acceptance was measured through perceived benefits, perceived risks, trust and knowledge. Meanwhile, industry strategy was assessed by both managerial interpretation and risk propensity. Approval process, risk assessment, labelling and traceability were used to measure government regulation. Besides, the industry acceptance of GMF would also depend on the positive and negative attitude shown by the stakeholders (food manufacturers or producers). The findings illustrated that GMF acceptance in the Malaysian food industry

increases, in which led by the implementation or support of proper strategy, systematic regulatory and positive attitude's feedback or response acquired from the stakeholders. These contribute to the significant impact on Malaysian context as GMF is a new topic and present at a very low level. This finding would also assist current food manufacturers and producers to obtain in depth understanding related to GMF and able to remain in the challenging market at this moment which includes improving processing features of food, new product differentiation, well-organized food supplies, low cost of production and product development through commercializing and the use of GMF. Finally, since the Malaysian food industry still is in the infant stage of accepting GMF usage, it is hoped that Malaysian food industries would continually open their eyes and positively react to accept the use of GMF such being done by other manufacturing industry from developed nations.

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