

SELECTION CRITERIA FOR FOOD PACKAGING INNOVATION IN THAILAND

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Abstract- Packaging technology can be used as a business tool for competitive advantage in the food industry to comply with consumer lifestyle urgency and the aging population. Currently, there are several researches on innovative food packaging nationwide from both academic institutes and industrial firm in Thailand. The selection of these for transfer to industrial is crucial. There for this paper is intended to propose the criteria for selecting the most suitable technology packaging support to food industrial in Thailand. Literature review on innovative packaging was conducted for study the alternative technology and also the literature on technology selection in various researchers was reviewed to propose the suitable criteria for selecting the food packaging technology. In addition, in-depth interview with nine participants in the relevant sectors was conducted for study the opportunity on innovative food packaging in Thailand.

The results of literature review we focus the innovative packaging technology through functionality and through resource or environment. It can be proposed four main criteria influencing to selection for food packaging technology as (1) Technology Aspect (2) Marketing & Business Completion (2) Financial & Economical and (4) Strategy, Social and Environmental Criteria. These main criteria may be separated to twenty-one sub criteria. For the result of in-depth interview can be summarized three main points for opportunity of innovative food packaging in Thailand as: (1) The innovative food packaging in Thailand may be driven by the large food firms under corroborate with university or research institute. (2) The Research and Educational institution is conducting research on some innovative packaging technology such as active packaging, intelligent packaging and biodegradable packaging. They believe that whenever the innovative technology from developed countries to expand close to local, their research will be useful for transfer to food industrial. (3) New vision of Thai regulation and current global trend may drive the entrepreneur has developed advance technology to survival.

Keywords- Innovative Food Packaging Technology, Selection criteria, Current Trend

I. INTRODUCTION

In recent year, consumer lifestyle has been influenced greatly by aging population, and increasing number of smaller families, single-person households and dual-income families. As a result, consumers are increasingly demanding food products that are convenient, taste good, are safe, wholesome, and nutritious. This has also created opportunities for innovative foods packaging has played an important role in the development of convenient food product such as microwavable foods and refrigerated meals (Lee and Yam, 2008 refer in Yam and Lee, 2012). Increasing market demands have long been known as major drivers behind firms 'continuous investment in research and innovation, and is necessary to remain competitive (Chen, Anders, and An, 2013). Food packaging become to business tool for competitive advantage in food company (Coles, 2003). It is one of the most important processes to maintain the quality of food product during storage, transportation and distribution to end user. Several trends in food packaging technology have been improved to meet the need and want of the end user including source reduction, design to convenience and handling, reduce the spoilage during distribution and decreases the cost of preservation facilities. It extends the shelf

life of foods and provides safe foods to consumers (Han, 2014)

Currently, several researches on innovative food packaging in university, research institute and company in Thailand have increased and more complicated. These technologies may have potential transfer to food industry in the future and it may make difference for competitive or it may be a threat to the organization the same time. Therefore, the objective of this study are discussion of potential innovative food packaging technology will be transferred to industry and also proposed the criteria influence of technology selection for food packaging focused ready meals for food industrial in Thailand.

II. TREND OF INNOVATIVE FOOD PACKAGING

A continued trend in food packaging technology will be development of new high barrier materials, nanotechnology, and improved convenience features related to production, distribution, sales, marketing, consumption and waste disposal increased food safety, environmentally friendly and smart or intelligent packaging (Han, 2007 refer in Lakoyrua, Anantheswarn and Floros, 2013). Yam and Lee (2012) suggested emerging food packaging

technologies base on packaging function consideration including protection, convenience, communication and containment and package environment consideration similar with Ragaert, (2012)proposed trends in food packaging through resource and functionality to 4 subject including sustainability, delicious healthy, conscious and demanding, and convenience. Also we may create conceptual of emerging or innovative food packaging trend and give the example as the Figure 1.

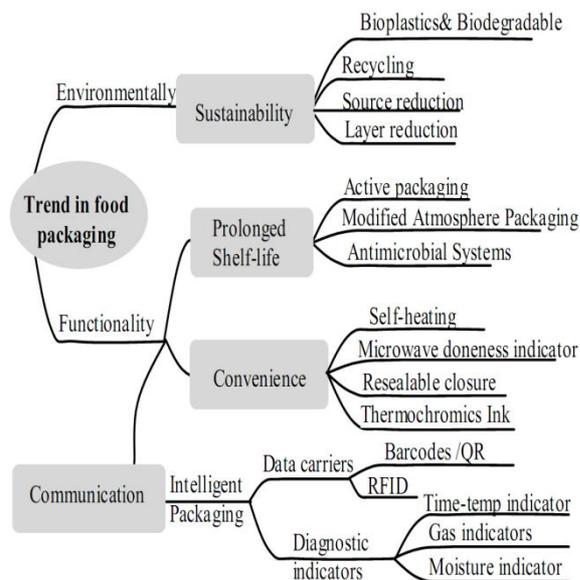


Fig.1. Trend of innovative food packaging

Functionality innovative food packaging

The main function of food packaging is to maintain the quality and safety of food product during storage and transportation, and to extend the shelf-life of food product such as spoilage microorganisms, chemical contaminate, oxygen, moisture, light external force, etc.,(Rhim, Park and Ha, 2013). A packaging can be divided four basic functions of protection, convenience, communication and containment (Yam and Lee, 2012). For containment function is conventional function that depends on size, weight, form and shape. So, it will be not concerned with innovative packaging in this paper.

- [1]. Protection: The functional of protection for innovative food packaging in this paper mean prolonged shelf-life including Active packaging (such as oxygen scavengers, ethylene scavenging, carbon dioxide scavengers, etc), Antimicrobial, Modified Atmosphere Packaging used to enhance the protection function, has received much attention in recent years.
- [2]. Convenience : This an important function to satisfy today's busy consumer lifestyle such as convenience food packaging for ready to eat meals, heat and eat meal and shelf heating package. Examples of convenient features are

easy opening, resealability and microwavability. Innovations are constantly sought to provide more convenience without sacrificing quality of increasing cost

- [3]. Communication: In this communication function is important to facilitate easy distribution and retail checkout, such as time-temperature indicators (TTI) and RFID, which enable the packaging to communicate more effectively for the purpose of ensuring food quality and safety. Intelligent packaging is new technology that pushes the communication function to a higher level.

Environmentally friendly food packaging

Another useful consideration to help identify packaging innovations in this paper is package environment. An important strategic issue facing the food industry is the political and public pressure over the environment, particularly in relation to concerns over the amount of packaging and packaging waste. Environmental policy on packaging should focus on resource-efficiency and not just waste and recycling (Coles, 2003). A strategic response to environmental issue may include source reductions, recycling, and layer reduction. Biodegradable packaging material or called biopolymer is the important technology that obtained from renewable biological resource with excellent mechanical and barrier properties and biodegradable at the end of their life (Rhim, Park, Ha, 2013).

III. RESULTS AND DISCUSSION

Opportunity of innovative food packaging in Thailand

In Thailand, food industry consumes most of packaging (60 percent of the overall packaging) as packaging is crucial to the competitiveness of food and beverage businesses. The decision for most people to buy food is based firstly on the presentation of the packaging. Currently, innovation in packaging technology is not widely used due to high costs and less resistance than ordinary plastics packaging. However, the demand is expected to grow in the future as consumers are conscious of the importance of information on the quality of goods. The producers themselves also must continue to develop new forms of packaging as long as consumers still interest the packaging (Analysis Situation of Thailand's Food Industry, 2012)The study was conducted in 2015 by collected qualitative data from literature reviewsuch as packaging magazine, news, seminar materials on ready meal packaging area. Moreover, data was collected by In-depth interview the community concerned with food packaging to study the status of food packaging technology in Thailand. The situation

and opportunity of Innovative packaging for food industrial in Thailand can be summarized as follows;

- [1]. Mostly food entrepreneur in Thailand are small firm that needed support from government agency projects to improvement packaging by focusing only passive function. However, for a few large firms are starting corroborate with research institution and university to developing the active function packaging technology. So, innovative food packaging in Thailand may be driven by the large firms in the future.
- [2]. The Research and Educational institution is conducting research on some innovative packaging technology such as active packaging and intelligent packaging and biodegradable packaging. Due to they believe that whenever the innovative technology from developed countries to expand close to local their research will be useful for transfer to food industrial.
- [3]. New vision of Thai regulation and current global trend to drive the entrepreneur has developed advance technology for survival, such as case of changing polystyrene foam package to biodegradable plastics. Although, there are limited for developing of biodegradable packaging with ready meal packaging in subject of resist freezing or heating temperatures of foods it has possibility for other categories food. Moreover, it is expected that the large local company (PTT) will invest for provide biobase materials plant such as polylactic acid to be used as biodegradable packaging that effect to lower price in the future.

Criteria influence for selecting of innovative food packaging technology

The criteria for selecting food packaging was applied in any technology from various researchers by literature reviewed. The criteria were classified to four main criteria as (1) Technology Aspect (2) Marketing & Business Completion (3) Financial & Economical and (4) Strategy Social and Environmental Criteria. We have divided it to twenty sub-criteria as shown in the table 1.

Table 1. A specified of criteria and sub criterial for tehcnology selection in food firm

Criteria	Explanation	Reference
1. Technological Aspect		
Advancement	Level of advancement of alternative technology for food packaging compare with existing technology	Shenet et al. (2010) Shen et al. (2011)

Reliability	The ability of the technology to perform consistently under specified conditions.	Choudhury et al. (2006) Ghassemi & Danesh (2013) Kengpol, & O'Brien (2001) Shehabuddeen et al. (2006) Vats et al. (2014)
R/M available	Difficulty or ease of procurement for R/M use for packaging production such as find in the local or import	Habib et al. (2009) Kandrick & Saaty (2007) Kumar, (2004) Lawson et al. (2006) Ma et al. (2013) Meade & Presley (2002) Mohanty et al. (2005)
Technology Risk	The uncertainty or the possibility that cannot meet the requirements in the technology will be selected.	Coldrick et al. (2005) Kandrick & Saaty (2007) Lawson et al. (2006) Rahmani et al. (2012) Shenet et al. (2010) Shen et al. (2011)
Feasibility	The possibility to adopt alternative packaging technology for used or develop the existing technology by the alternative technology until successful.	Habib et al. (2009) Kandrick & Saaty (2007) Kumar, (2004) Mohanty et al. (2005) Meade & Presley (2002) Vats et al. (2014)
Expandability	expanded to wider scope of the alternative packaging technology such as applied for several products	Ghassemi & Danesh (2013) Ma et al. (2013) Shen et al. (2011)

2. Marketing and Business Competition		
Effect on existing market share	Existing market share was greater when developing the alternative technology for food packaging	Büyükköçkan et al. (2012) Coldrick et al. (2005) Habib et al. (2009) Lawson et al. (2006) Ma et al. (2013) Meade & Presley (2002) Mohanty et al. (2005) Shen et al. (2010) Shen et al. (2011)
New market potential	The opportunities for new market or new customer segments when the alternative technology was applied.	Kandrick & Saaty (2007) Ma et al. (2013) Meade & Presley (2002) Shen et al. (2010) Shen et al. (2011)
Timing to market	Duration of the alternative technology will be transferred to meet market needs.	Habib et al. (2009) Lawson et al. (2006) Rahmani et al. (2012) Shen et al. (2010) Shen et al. (2011)
Business risk	Uncertain or likely to be unable to achieve sales volume or unable they require quantity at the required cost.	Coldrick et al. (2005) Lawson et al. (2006) Shehabuddeen et al. (2006) Shen et al. (2010) Shen et al. (2011)

3. Financial and Economic Criteria		
Initial Investment	The cost of adjusting or establish machine, equipment, set-up process when start the alternative technology for food packaging	Amin, & Zhang (2012) Ghassemi & Danesh (2013) Hsu et al. (2010) Rahmani et al. (2012) Vats et al. (2014)
Payback period	Time to get a return on investment in terms of cash.	Interviewed
Potential return on investment	The potential return on investment in the alternative technology for food packaging.	Hsu et al. (2010) Kandrick & Saaty (2007) Lawson et al. (2006) Shen et al. (2011)
Financial status	Financial status such as the assets, liabilities, liquidity that can be used to support the activity in developing the alternative technology	Amindoust et al. (2012) Ávila et al. (2012) Choudhury et al. (2006) Habib et al. (2009)
Price of product	The suitable price of the new packaging that customers are willing to pay.	Amin, & Zhang (2012) Amindoust et al. (2012) Ávila et al. (2012) Büyükköçkan et al. (2012)

4.Strategy, Social and Environment		
Image / Reputation	The image of the product derived from the alternative technology is appropriate and consistent with the needs or social situation.	<i>Kumar, (2004) Interviewed</i>
Environmental Impact	Environmental impact may has caused by the usage or develop the alternative technology such as waste, resources consumption, etc.	<i>Amin, & Zhang (2012)</i> <i>Amindoust et al. (2012)</i> <i>Ávila et al. (2012)</i> <i>Choudhury et al. (2006)</i> <i>Davoudpourr et al. (2012)</i> <i>Ghassemi&Danesh(2013)</i> <i>Hsu et al. (2010)</i> <i>Ma et al.(2013)</i> <i>Meade & Presley (2002)</i> <i>Mohanty et al.(2005)</i> <i>Rahmani et al.(2012)</i> <i>Shehabuddeen et al. (2006)</i> <i>Vats et al. (2014)</i>
Human health Impact	Human health impact may has caused by the usage or develop the alternative technology	<i>Amindoust et al. (2012)</i> <i>Hsu et al. (2010)</i> <i>Meade & Presley (2002)</i>
Regulatory Impact	Regulatory impact may has caused by the usage or develop the alternative technology	<i>Amindoust et al. (2012)</i> <i>Coldrick et al. (2005)</i> <i>Hsu et al. (2010)</i> <i>Lawson et al. (2006)</i> <i>Meade & Presley (2002)</i> <i>Mohanty et al.(2005)</i> <i>Shehabuddeen et al. (2006)</i>
Patentability	The advancement or novelty of alternative technology can be created the patent for the organization.	<i>Coldrick et al. (2005)</i> <i>Davoudpour et al. (2012)</i> <i>Lawson et al. (2006)</i>
Social ambience	The alternative packaging technology has suited to the lives of people in the society that cause to acceptable.	<i>Choudhury et al.(2006)</i> <i>Kandrick&Saaty (2007)</i> <i>Kumar, (2004)</i> <i>Mohanty et al.(2005)</i>

CONCLUSIONS

Innovative food packaging may be driven by the need of industry and sustain competitive advantage included changes in consumer lifestyle. However innovative food packaging technologies need to be inexpensive relative to the value of product or food contact safe. So, the selection criteria for food packaging technology proposed in this paper will be weighted by expert opinions for prioritized according to Analytical Network Process (ANP) in the further research. It may applied for decision making support to the food industry firm in Thailand when the technology expand close to the local.

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