

Development of Hybrid Food Products Safety Control Technology and Green Supply Chain Management (GSCM): Theory and Design

(Research Article)

Hibrid Gıda Ürünleri Güvenlik Kontrol Teknolojisi ve Tedarik Zinciri Yönetimi (GSCM) Gelişimi: Teori ve Tasarım

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ABSTRACT

The purpose of this paper is that we provide several embodiments factors for food safety control technology and Green Supply Chain Management (GSCM) platform in this field with examples to show how these embodiment factors contribute to different applied business research aspects. Food safety control technology standard protocol from existing multidisciplinary literature was processed for theorization, which uses grounded theory methodology rather than a description of the data. This research reviews about GSCM and their applications with a platform innovation. Kim's Hybrid Food and Safety Control Technology have classified the safety management technologies as the regulation of inputs.

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1. INTRODUCTION

In recent years, the environment has become a critical issue of concern about the increase in the consumption of packaged foods impact of the products and service packages consumer in order to make improvement in quality, packaging, and marketing campaigns of food processors purchase in the market place (Dries and Ward, 2015:30). The most serious problems are global warming, depletion of natural resources, and pesticide poisoning because increasing capital is drained into either extracting resources, adapting to pollution, producing sufficient food or developing technologies to offset these physical limits (Ansell and Cayzer 2018:515). Business organizations are affected by internal and external factors in adopting environmental practices, defined as management practices for applying the eco-design of

firms, reducing material usages, and maintaining environmental systems (Kim and Chai, 2017:2). As the public becomes more aware of environmental issues and global warming, consumers are asking more questions about the eco-labelling. An eco-labelling scheme based on product performance, such as labels claiming biodegradability of packaging, sustainability in production processes or non-pollutant aspects of product usage will require certain trust on the part of the consumer (Sarkar 2015:109). However, the implementation of Green Supply Chain Management (GSCM) and the impact of these practices on corporate performances are still in a nascent stage (Younis, 2016:4). According to Pham (2017:807), Supply Chain Management (SCM) plays an important role in the Vietnamese economy, especially in Vietnam's retail supply chain. In addition, consumer's health has received much more attention by managing the contents of hazardous substances and agricultural by-products. In recent years, Vietnam faces many challenges food safety issues are the result of both widespread soil and water pollution and poor practice by agricultural products, food business operators and cost the country millions of dollars every year from the treatment of illnesses (World Bank Group, 2016:15). Yeung and Yee (2012:40) demonstrated that a substantial portion of the variance between food risk and quality to improve consumers' purchase intention might prompt the research. Food industry adopts numerous business improvement methodologies such as logistics and food safety labelling and packaging to improve business performance measurement. Supply Chain Management (SCM) has been regarded to be the crucial factor for the companies to obtain a competitive advantage (Li 2014:1). In this paper, we provide a food safety technologies and implementation scope, which defines the embodiment of key factors in the technologies. The main purpose of this paper is that we provide several embodiment factors for food safety management platform in this field with examples to show how these embodiment factors contribute from different applied business research aspects.

Design Element 1: There is an element of embodiment for food safety packaging controller

Duncan (2011:2) demonstrated that a portion of food must be contained in a package that serves numerous functions such as protecting the food from dust, oxygen, light, microorganisms, moisture, and other harmful substances. According to Truong, Yap, and Ineson (2012:529), potential Vietnamese consumers are very concerned about food safety whilst the females also appreciated their nutritional value. Findings that indicated environmental sustainability concerns did not influence consumer buying decisions. Because of their perceived superior quality, potential Vietnamese consumers were not price sensitive towards foods. Therefore, when purchasing organic food, consumer buying behaviour may be influenced by food safety and health concerns which make claims about positive effect of consumer buying behaviour on organic food.

Government policy and guideline will be added into Hybrid Food Safety Control Technology. According to Li and Zeng (2009:1991) supported the hypothesis that specific government certified regulation would be more responsible and their food safety would be improved to increase the awareness of food safety issues and food safety standards and other government regulations that apply equally to non-certified producers (Sarkar 2015:109). Onel (2017:103) states that government policymakers and marketers are advised to adopt various rules, regulations, sustainability marketing to help consumers become more informed in terms of communicating different normative aspects of consumer buying intention. The relationship between consumer buying intention and Radder and Le Roux's Consumer Food Choice Model can be investigated in a variety of variables in which market related forces are hypothesized as the product quality, distribution, and price (Radder and Le Roux, 2005:585).

Vietnam is a rapid economic developing country and market to study consumer buying intention because food safety has traditionally been an important aspect for consumers in Vietnam (Mergenthaler, Weinberger, and Qaim 2009:268). Moreover, new demand for products with special convenience the restructuring of supply chains are emerging growing importance of food safety and quality in the Vietnamese retail sector (Mergenthaler, Weinberger, and Qaim 2009:268).

Design Element 2: There is an element of embodiments for food safety labelling controller

When packaging materials prevent extensive sensory exposure, a consumer must rely on sell-by dates, which are determined by producers based on a set of idealized assumptions about the way that the food is stored or transported (Duncan 2011:14). Within the sense of taste, one can experience 'salty', 'sweet', 'sour' and 'bitter' sensations; while within the visual sense one can experience sensations of 'blue', 'green' or 'red' (Meiselman and MacFie 1995:5). Similarly, one can experience differences in the magnitude and duration of the sensation. Thus, the sweetness of an apple may be of low, intermediate, or high intensity; and the pungency of a jalapeno pepper may persist for only a few seconds or for several minutes. Supply Chain Management has its beginnings in physical distribution and logistics, and it has recently concentrated on close relationships between parties involved in the flow of goods from the supplier to the customer. Studies in GSCM have been performed in the food, beverage, and construction sectors (Ojo et al., 2014:148; Frederick & Elting, 2010:2). The purpose of this paper is to provide a Vietnam GSCM model for the identification of what drives the agriculture sector to implement food safety labelling practices, and possible outcomes of successful implementation in Vietnam.

In this research, first, the variable of environment concerns will be added into Design of Hybrid Food Products Safety Control Technology. Because when environment concerns added to the Radder and Roux's Consumer Food Choice Model, measures relating to taste could also influence consumers' product preference that are typically found to improve significantly the perception of nature with consumers' intention to buy food products with information of taste (Radder and Le Roux 2005:586). For example, the various items of food choice motives on organic tea were grouped under eight factors namely health and health benefits, familiarity and interest, sensory appeal, political and religious values, price, mood, frame of mind, environmental protection, and convenience (Sakthirama and Venkatram 2013:36). Therefore, when purchasing organic food, consumer buying behaviour may be influenced by environmental concerns which make claims about positive effect on buying intention toward organic food.

Design Element 3: Environmental concern is positively related to purchase intention of organic food.

The product's packaging supplier in supply chain management who had formulated a new plastic container that was biodegradable when exposed sunlight and water had approached a manufacturer of packaged food products including polyhydroxyalkanoates (PHAs), polylactic acid (PLA), zein, soy protein isolate, starches, cellulose, gluten, whey protein isolate, and chitosan (Han et al. 2018: 872). The findings indicated that the respondents were the development of sustainable or green packaging has the potential to reduce the environmental impacts of food packaging through the use of active, intelligent, and green packaging technologies can work synergistically to yield a multipurpose food-packaging system with no negative interactions between components (Han et al., 2018: 860).

2. PROBLEM STATEMENT

The guidelines of organic agriculture not only restrict use of chemical fertilizers, but it is also not permitted to use pesticides to use in certified organic agriculture. The requirements for safe vegetable production are not nearly as stringent (Simmons 2008:50). According to Gutman 1999:2357), organic food is not just about a product, it is a philosophy in which the process of production is as important as the final results. Thus, eliminating chemical fertilizer and pesticides is not necessarily the primary goal of organic food farming but it is maximizing the health of the soil (Gutman, 1999:2357). EU legislation gives some advice related to the residues of pesticide (Tiryaki 2017:11). However, there are few studies on green supply chain management in Vietnam. The purpose of this research is to assess the factors affecting the Vietnamese government implementation of GSCM in the organic agriculture sector.

The research questions are constructed below:

- 1) What is the Food Products Safety Circuit Design Elements as the specifications in Model-Type 1 on food safety standards?
- 2) How to verify the interconnection between the embodiment of the packaging and the embodiment of labelling elements?
- 3) How may the implications of this Circuit develop the Food Safety Products Circuit Design for products safety packaging and labelling management in a more practical way toward packaging and labelling in GSCM?

3. LITERATURE REVIEW

3.1. Green Supply Chain Management

Darnall, et al., (2008:30) defines Environmental management systems are strategic management approaches that define how an organization will address its impacts on the natural environment as the application of environmental management principles to the entire set of activities across the whole customer order cycle, including consumers of ways to reduce their impacts on the natural environment by using the certification process on ISO 14001 certified facilities (Darnall et al., 2008:39). Some studies also emphasize environmental concerns in greening a supply chain, defining it as a set of supply chain management policies, and relationships that pay close consideration to the natural environment performance measurement when an enterprise distributes its resources (Ojo, Mbohwa, and Akinlabi 2014:146; Younis 2016:14; Hervani, Helms, and Sarkis 2005:330). In addition, Huang (Huang 2013:37) stated that environmental awareness should be integrated into Supply Chain Management (SCM) throughout the whole process, from international standards of raw materials to the terminal disposal of goods to achieve and minimize environmental negative effects to be environmentally sustainable. Recently, Green Supply Chain Management (GSCM) aims to maximize the overall environmental profit by adopting a life-cycle approach through product design, material selection, manufacturing, and sales and recovery (Ojo, Mbohwa, and Akinlabi 2014:146). Khoi, Dung, and Nga (2016:43) conducted a study on Japanese manufacturing and found that supply chain collaboration impacts a form of Research and Development (R&D) investment in environmental technologies. Further, the main key areas such as environmental performance indicator that implement GSCM have been proposed by Hervani et al., (2005:339). Environmental performance indicators are described in ISO 14031 (environmental management-environmental performance evaluation

of the ISO 14001 accreditation guidelines). However, the innovation of GSCM is necessary for a number of reasons in response to external pressures. For example, business performance measurement (Hervani et al., 2005:339) as the most significant area that related to organic agricultural sector.

3.2. Green Supply Chain Management Practice for food and pharmaceutical industry

In the Vietnamese pharmaceutical industry, there is two main weakness point to manage the industry in terms of lack of capacity of the local industry in supplying key raw materials and (2) inefficient pharmaceutical products quality control lack of adequate human resources (3) insufficient food safety or unsafe living and working conditions (Angelino et al. 2017:4). The Green Agriculture Products Supply Chain (GAPSC) divided into green purchasing, green production, green manufacturing, green logistics, green marketing, green consumption, and advocate green consumption, to ensure quality and safety of agriculture products (Iakovou et al. 2014:5). GSCM is a series of production systems that maintain the environmental sustainability, using organic pesticides and avoiding, for instance, the use of antibiotics and growth hormones. The organic producer must respect established norms in all production stages, from the seeding process until packaging, always concerned about the process' impact on the natural environment (Vieira 2013). Most of the literatures have focused on standard regulations for potential hazardous foods or GSCM performance measurement. The model of GSCM in organic products is presented (as shown in Figure. 1).

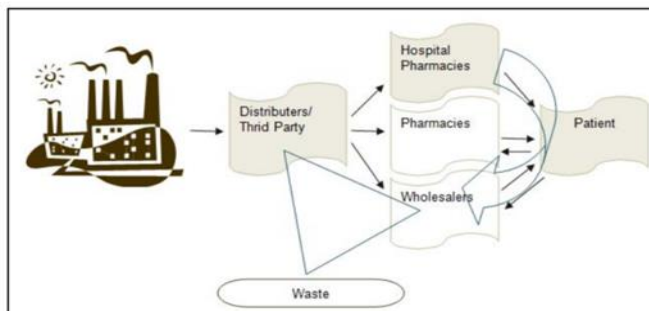


Figure 1. Model-Based Green Supply Short Chain in Organic Products (Adapted from Bravo and Carvalho 2015:234).

From the above Figure 1, it is evident that an logistic for a pharmaceutical drug product has as many short supply chains as it has farming, manufacturing and retailers, because for each pharmaceutical drug product, the shopper' requirements and the conventional tactics of purchasing might be different. In addition, organic production and transportation will be eco-friendly, with distribution systems constructed in the most optimal design for reducing the environmental costs of packaging. It is available to reduce logistics costs by new materials implementation by delivering newly manufactures products in order to logistics in the existing supply chain means benefits for optimizing common resources and guarantee the supply of its private label products (León-Bravo et al. 2017:10). The adoption of sustainability practices helps business to distinguish them from competitions through the reduction of risks for increasing efficiency of materials and innovating by new environmentally friendly products (Bravo and Carvalho 2015:236).

3.3. Eco-Design

This research adopts the definition developed by Moreno et al (2016:8). Moreno et al., (2016:8) for eco-design, which preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows; meaning that technology and processes are chosen wisely according to their use of renewable or better-performing resources. Lakshmeera and Palanisamy (2013:46) investigated the conceptual framework on related eco-design practices and packaging related green-design practices on environmental, economic and intangible performances (Lakshmeera and Palanisamy 2013:46). They found that eco-design practices are to create an environmental stance as a driver for improved brand image.

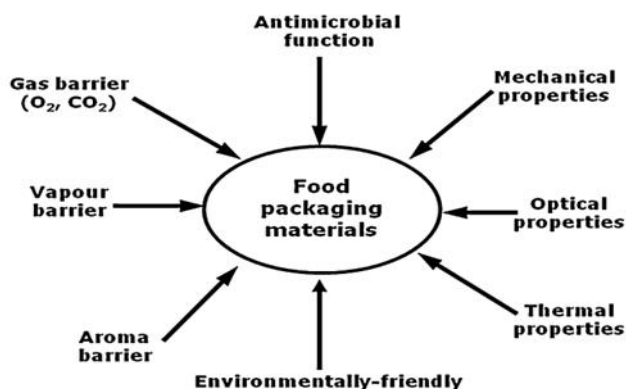


Figure 2. General properties required for food packaging Materials (Rhim, Park, and Ha 2013:1630)

Despite the centrality of product design to marketing implementation in relation to empirical studies of product design is some debate whether product-related beliefs derive from holistic visual perceptions of the product's form or from linear processing of one design element for its study (Bloch 1995:19). However, those disciplines have not developed a conceptual model for its study. The design of Hybrid Food and Pharmaceutical Products Safety Control Technology is intended to provide a more systematic approach to the study of design issues and to facilitate the undertaking of empirical work on product design. The first components make choices regarding elements for example products form may create or influence beliefs pertaining to such characteristics as durability, technical sophistication, ease of use and prestige by adding to the complexity of the tasks such as product form, designer's also provide constrains and objective of their own (Bloch 1995:19). In attempting to bring needed attention to the subject of product design, this study develops a Hybrid food safety packaging and labelling technologies for its study.

3.4. Elements of Labelling Design

Food and Pharmaceutical Products such as labelling and packaging are integrated elements of products safety standards. Product design is a broad term that included a considerable range of designs elements. Bloch (1995:19) indicated elements of packaging design are an integral part of the brand name (Bloch 1995:19). This design also decides how to integrate two embodiment elements in terms of food safety technology and food safety information. Kim and McDonald food safety labelling model suggests the effective collaboration between the guideline of the government policy sector and the private sector in implementing the legal

framework to ensure access to the retail food industry (Kim and McDonald 2018:2). Furthermore, Kim and McDonald food safety labelling model has classified the good safety labelling management into three broad categories which are labelling, environmental labelling standards, and national legislation (Fig. 3).

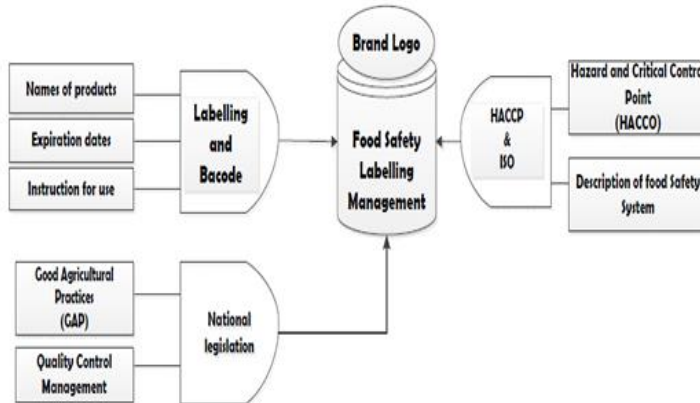


Figure 3. Design of Kim and McDonald Food Safety Labelling Techniques (Kim & McDonald, 2018:2)

The concept of Kim and McDonald Food Safety Labelling Techniques involves the regulation of inputs such as labelling and barcode, national legislation, HACCP and ISO, which implements logical conjunction. If all seven inputs of correct labelling contribute to the gate of food safety management, self-designed brands and Eco Symbols by retailers can be shown to have high output results in food safety labelling management. KIM and McDonald Food Safety Labelling Techniques improve food safety labelling and environmental standards by using an observational study for improving the visualization of food safety labelling management and contributing an environmental solution in the following ways (Kim and McDonald 2018:2). Despite, the growing emphasis on Food and Pharmaceutical products insecurity in developing and under developing countries, however, The Kim and McDonald Model cannot insight the complex technology in terms of packaging and labelling.

3.5. Eco-Design Cooperation

Eco-design is considered one of the green supply chain (SCM) initiatives because it integrates environmental aspects into the product design process, taking into consideration the entire flow of the product in its supply chain (Eltayeb, Zailani, and Ramayah 2011:497). Adopting green supply chain practices requires internal and external cooperation among different stakeholders (Caniëls, Cleophas, and Semeijn 2016:1008). Environmental cooperation activities take place between the supply chain processes in terms of eco-design, environmental technology, green packaging, use of less energy during transportation of materials and goods, as well as effective support by management capacity enhancement such as environmental technology research and development (Caniëls et al., 2016: 1008). Green service support is an environmentally responsible practice that focuses on the use of environmentally friendly materials, conservation of materials, recycling, and energy efficiency (Wong et al. 2016:49). In addition, environmental cooperation between different stakeholders within the supply chain including the raw material supplier, the manufacturer,

the logistics provider, and the customer needs to take place to introduce an environmentally responsible design for a product that is safe and easy to recycle. Packaging phase is thus the main environmental hot-spot for global environmental effects allowing driving eco-design measures for the product–package system (Del Borghi et al. 2018:30).

3.6. Reverse logistics

Reverse logistics is defined as the return or take back of products and materials from the point of consumption to the forward supply chain for the purpose of recycling, reuse, remanufacture, repair, refurbishing or safe disposal of the products and materials (Eltayeb et al., 2011: 498). For other defective products, reverse logistics sends them back to factories for recycle, re-using some components. Reusing is the process of collecting used product from the field and distribution. Furthermore, recycling is the process of collecting used products such as components and materials into recycled products (Eltayeb, Zailani, and Ramayah 2011:498). Reverse logistics is one of the most commonly used GSCM practices in the extant literature (Younis 2016:14). The study revealed that there are significant differences among ISO 14001 certified organizations in the way they run their environmental operations, and no relationship was found between environmental and business performance (Younis, 2016:14). Nanotechnology in the food packaging sector in the packaging technology plays an important role in order to packaging in terms of antimicrobial edible coatings and films have a variety of advantages such as biodegradability and biocompatibility (Rhim et al., 2013:1644). In addition, control of oxygen levels in food and pharmaceutical products packages is important to limit the possibility of spoilage reactions.

3.7. Gaps in the literature

Even though, there is limited literature on GSCM practices in Vietnam, a cases study of Vietnam food safety on green supply chain management, but there are still a few on GSCM practices in the organic agricultural sector. In Thailand, a few of studies have been done on organic supply chain management among Southeast Asia, but in Vietnam, literatures on GSCM are rare. There are a few case studies on organic supply chain management for small farmers in developing countries.

4. METHODOLOGY

A desk top review of literature on the case study of implementation of GSCM practices in packaging and labelling processes was carried out. This case study of development design applies the theoretical framework of Hybrid Food and Pharmaceutical Products Safety Control Circuit in Figure 2 to suggest Food Safety Products Management Technology.

4.1. Technical challenges in product platform development

The use of hybrid food product safety concepts during the early phases of food product safety platform development is rare. Some examples, however, suggest product development, technology development using function platforms (Johannesson et al. 2017:196). This research implemented the function platform enable the reuse of food safety technology and food safety information of applied business variables. Brand name enables hybrid horizontal factor of the food safety platform that is, being able to offer food products in different food product categories while sharing components between food safety technology and food safety information. It is accommodated through interconnect building platform that fulfils a certain array of food safety platform. The approach supports design architects on hybrid food products safety control circuit in making a design decision that propels the platform

development work by enabling analysis in stages where designs are evaluating the goodness of alternatives early.

5. DESIGN GOALS AND CONSTRAINTS: DEVELOPMENT PROCESSES

5.1. Green purchasing has a positive impact on GSCM practices success

Scientists and industry stakeholders have already identified potential uses of nanotechnology in virtually every segment of the food industry from agriculture for safety processing in food and agricultural area (Duncan, 2011:1). Food Safety Standards System in Vietnam is controlled by the Ministry of Science and Technology (MOST) and coordinated by the Ministry of Health (MOH), Ministry of Trade (MOT), Ministry of Agriculture and Rural Development (MARD), Ministry of Fisheries (MOFI), Ministry of Industry (MOI), Ministry of Finance (MOF) and Ministry of Culture and Information (MCI). Tam (2015:92) posted the VietGAP which is standards and guidelines to assist individuals or organizations, producers and consumers for controlling the quality of input materials and water, maintaining good health, ensuring a better life for farmers, as well as maintaining the integrity of the environment. These also serve to protect environment and use for product identification, traceability and recall.

5.2. The Main Construct of Food Safety Standard practices

Food Safety Standard practices refer to the integration of environmental management and risk controls thinking into retail sector with entire process including system management in layers to address the sustainability aspects and good practices of the organizations to three aspects of sustainability in terms of enhancing environmental sustainability performance (Sulistio and Rini 2015:296). Environmental education of the consumer contribution has been previously examined in the operations management and environmental management towards green products literature (Junior et al., 2015:100). Even with above research, the findings of the factor analysis have established for professionals in Food Safety Standard practices that it is becoming increasingly important to be green by applying the greening principles to all factors of the ecological greening including processes to reduce solid wastes and air emissions for healthier ecosystem such as material sourcing, selection, manufacturing and reaching the customer with green products (Mohanty & Prakash, 2014:1330).

5.3. Reverse Logistics impact on GSCM practices success

Lead in ensuring conditions for preservation of food during transportation in accordance with the instructions of producing and trading organizations and individuals. Not transporting food together with toxic goods may cause cross-contamination affecting to quality of food. The competent State body shall provide safeguard, regulatory capability, and legal framework for fresh fruits and vegetables and meat management in terms of route for the transportation management and water use efficiency by (i) incorporating localized reuse of wastewater, beginning with industrial wastewater; (ii) focusing on scaling up decentralized wastewater treatment options; and (iii) improving the knowledge base on groundwater quantity and quality.

The paper has an insight into the importance of GSCM in the organic agriculture sector, how it has been applied in the developing countries like India, Thailand, Brazil, Hungary and South Africa. Also, it has compared the green supply chain management in Vietnam, and it was reviewed that though there have been few empirical studies on Vietnam organic agriculture sector GSCM, only in a few of the cases reviewed on the general agricultural sector has been said about R&D investment of multi international corporations strive for

business profits in any literature about foreign direct investment in Vietnam by industry. This lack of relative literature has pointed out that there is a requirement of green supply chain management in the organic agriculture sector in Vietnam.

of food with respect to some categories of fresh and raw materials in urban areas according to Vietnam Food Safety Law 2010 (Ward and Bui 2013:1). Research and practice food safety system is also reviewed in the aspect of corporate social responsibility governmental regulatory attention in the immediate future matters in terms of environmental issues by its roles in developments in nanotechnology as it applies to foods and food-related systems, focusing specifically on applications (Duncan 2011:2). The World Bank has selected Viet Nam as a pilot country for the Forest Carbon Partnership Facility and is assisting the country to prepare for funding from the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) to address climate change issues in terms of reducing environmental degradation and improving sector resilience to climate change can have mutually reinforcing benefits for sustainability if effectively managed (Development Bank 2012:1). The Asian Development Bank continue to improve environmental technology protection, environmental

5.4. Bio-nanocomposites Materials or Recyclable

The focus on environmental management needs to improve water use efficiency by incorporating localized reuse of wastewater, beginning with industrial wastewater as well as focusing on scaling up decentralized wastewater treatment options. In addition, Vietnam government needs to improve the knowledge base on groundwater quantity and quality in informal collecting and recycling system, particularly with packaging waste, and waste paper.

5.5. Steps for Constructing

It is essential to continue developing a model of food safety management, with a focus on the guideline, logos, and labelling management and focus on food safety systems. Kim's Hybrid Food and Pharmaceutical Products Safety Control Circuit suggest the effective collaboration between the guidelines of the food safety technology and food safety information in implementing the theoretical technology framework to ensure access to the food and pharmaceutical sector.

5.5.1. Elements of Packaging Design

Design of Kim's Hybrid Food Products Safety Control Technology such as labelling and packaging are integrated elements of food safety embodiments. Product design is a broad term that included a considerable range of designs elements. It is essential to continue developing a model of Green Supply Chain Management (GSCM), with eco-design, green purchasing, management, reverse logistics and focus on food safety systems as an environmental cooperation. The Hybrid Food Products Safety Control Technology framework was identified two embodiments that are relevant to this development. Following a comprehensive review of the literature in Figure 4, the technology was developed by the concern about the environment and food poisoning to perform GSCM practices. Reducing food poisoning and green food product design are an important goal. This goal can be achieved by improving food packaging and labelling design and management, changing packaging styles, and educating food product designer to be environmentally responsible for green consumer behaviour.

To summarize, the fundamental food packaging and labelling are food safety technology (e.g. time-temperature indicator, oxygen indicator, carbon dioxide indicator, freshness indicators,

and microbial growth indicator) and food safety information (e.g. nutrition facts, bio nanocomposites materials recyclable, HACCP, ISO, and nutrition facts).

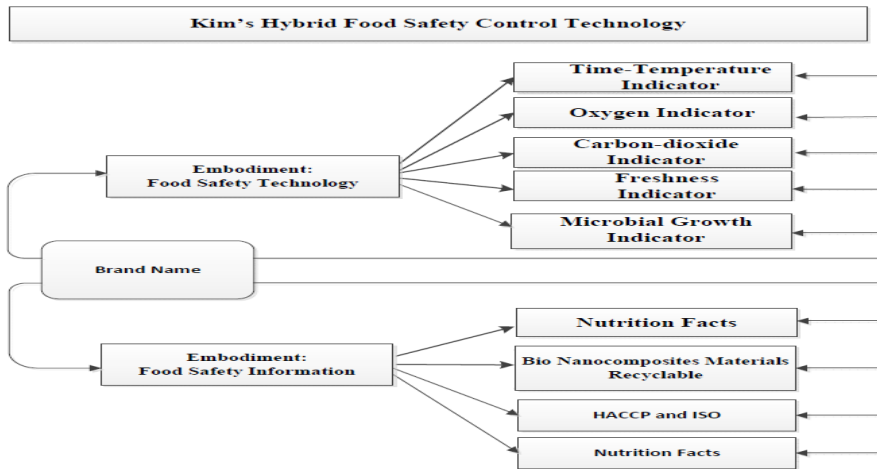


Figure 4. Design of Hybrid Food and Pharmaceutical Products Safety Control Technology (Own developed).

First, the labelling category composed of four subcategories such as names of products, expiration dates, and instructions for use, and barcodes. Second, a food safety system comprised of HACCP and ISO, such as a description of the food safety system, hazards and critical standards, and environmental labelling standards. Third, nutritional facts comprised of safety nutrition information, for instance, the management of products poisoning, biological contamination with regards to quality control management.

The concept of Kim's Hybrid Food Products Safety Control Technology involves the regulation of inputs such as the embodiment of food safety technology and an embodiment of food safety information, which reinforcement on brand name. If all nine inputs of correct embodiments contribute to the gate of brand name value chains. Time-Temperature indicator, Oxygen indicator, Carbon-dioxide indicator, freshness indicator, and Microbial Growth indicator can be shown to have high output results in Kim's Hybrid Food and Pharmaceutical Products Safety Control Technology to improve brand name and contributing a food poisoning solution in the following ways in Figure 5.

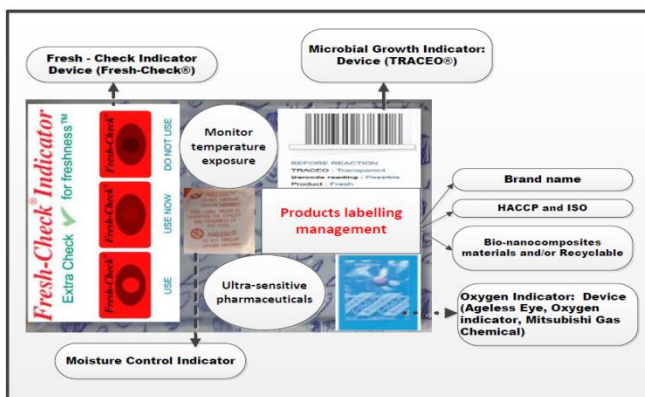


Figure 5. A Platform of Implementation of the Indicator in the Packaging (Own implementation)

- 1) To maximize the benefit of brand name via access to two embodiments such as food safety technology and food safety information;
- 2) To contribute to the improvement of food safety technology by adding indicators to labels and package such as the Time-Temperature Indicator, oxygen Indicator, Carbon-dioxide Indicator, Freshness indicator, and Microbial Growth Indicator;
- 3) To contribute to the improvement of food safety information by adding information such as Nutrition facts, Bio nanocomposites materials HACCP and ISO.
- 4) To strengthen GSCM practices and the manufacturing of raw materials for products in GSCM to ensure an effective implementation of its embodiments as well as the description of the brand name.

6. DIRECTION FOR THE FUTURE RESEARCH

Suppliers, manufacturers, and retailers need to introduce innovative food products which combine green consumerism and functional attributes in GSCM practices. In this research, factors influences consumer buying intention was not considered. Further research may investigate determinants of the relationships between the suggested Kim's Hybrid Food Safety Control Technology and consumer buying intention towards food products and pharmaceutical products.

7. CONTRIBUTION

To contribute to the improvement of food and pharmaceutical products and bioengineering in applied business by implementation the Kim's Hybrid Food Products Safety Control Technology to easily packaging and labelling in Green Supply Chain Management.

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