Chapter 1
Intelligent Packaging:
A Strategy for Boosting Sustainable Marketing and Contributing to the Sustainable Development Goals

Maria Palazzo
University of Salerno, Italy

Iza Gigauri
https://orcid.org/0000-0001-6394-6416
St. Andrew the First-Called Georgian University, Georgia

Maria Antonella Ferri
Universitas Mercatorum, Italy

ABSTRACT

Digitalization and sustainable development present a twin transition to the industry 5.0-based new normal. Companies try to achieve sustainability transformation through new business strategies in order to respond to the demand of their stakeholders. For this reason, food companies are striving to apply sustainability principles in product packaging design while considering the complete life cycle of a product. Therefore, intelligent packaging with sensor technologies and extended functions is emerging. It uses digital systems to package food to obtain real-time information on the features of goods during transportation or storage. While controlling the condition of food and the surrounding environment, it informs the manufacturer, retailer, or consumer of the state of the food. Therefore, the demand for intelligent packaging is growing in the food industry. This chapter explores intelligent packaging and defines the current trends in this innovative field.

1. INTRODUCTION

The focus of the modern age is shifted towards the interaction between humans and manufacturing machines to urge economic and social welfare while contributing to sustainable development goals. Unprecedented

digitalization accelerates sustainable production and consumption as well as a novel perception of food products. Intelligent packaging not only enables tracing and monitoring the quality and safety of a product but also increases the shelf-life of a food product. Advancing technologies require new business strategies and hence, cutting-edge and expert insight to research this transition. Moreover, volatile, uncertain, complex, and ambiguous (VUCA) environment implies companies to center on consumers' needs and wants to recognize their power for their business models as customer relationship has become essential.

Intelligent packaging with sensor technologies includes extended functions and uses digital systems to package food, cosmetics, medicaments, and other kinds of products. It is also adopted by brands in healthcare, logistics, transport, consumer electronics, and home care industries. Intelligent packaging provides information on the product quality during shipping and storage. It monitors the state of food and the surrounding environment and notifies the producer, retailer, or consumer of the condition of the food. Such smart, and interactive packaging enables tracing, and monitoring functions to ensure the quality and safety of a product, and hence, can help increase the expiration date of foodstuffs. Therefore, the demand for intelligent packaging is growing in the food segment.

In accordance with the changes in consumption, lifestyle, and consumer preferences (Palazzo et al., 2022), packaging strategy should respond to consumers' needs for safe and quality of food products as well as recyclable or environmental-friendly packaging. Thus, food packaging is evolving by applying new technologies to improve the quality of the product, prolong shelf-life, reduce waste and beneficially impact the environment.

Intelligent packaging is an innovative field of research. The era of globalization and digitalization has given rise to innovative solutions in a wide range of domains. As a result, Intelligent packaging is offering commercial benefits and further expansion. The sales of electronic packaging are expected to increase to USD 1.45 billion by 2023 (Akhzar, 2021). The intelligent packaging market is anticipated to be worth USD 26.8 billion by 2028 (Globe Newswire, 2022).

In addition, globalization of the food industry has created logistical challenges to distribute food from manufacturers to retailers to end users while preserving its quality and safety. The packaging material must prevent foods from microbial contamination and decrease the risks of food-related illness. Consequently, innovative packaging devices should monitor the food quality and environment around the product to enhance the safety and shelf-life of a product. Intelligent packaging allows companies receive actual information about the product without taking the samples to the laboratory for a costly and time-consuming analysis. Such packaging facilitates the transportation of frozen food not only between countries but also to remote areas by monitoring the conditions of food without touching the product.

Furthermore, a low-touch economy has emerged as a consequence of the Covid-19 pandemic that accelerated digital transformation (Gigauri, 2021a). Brands need to adjust the altered behavior of keeping physical distance, and deliver safe and sustainable products. In this regard, digitalization, seen as a solution to many of the grand challenges, is adopted also by the food industry to develop innovative packaging. New technologies such as RFID, EAS, QR codes, Data loggers, and other emerging technologies give rise to extending functions of intelligent packaging.

2. LINKING PACKAGING, SUSTAINABLE DEVELOPMENT GOALS AND SUSTAINABLE MARKETING STRATEGY

Previous studies found that consumers waste more food compared with other subjects in the value chain (Müller & Schmid, 2019). Preserving food quality and minimizing waste are among global sustainable

Related Content

Sustainable Supply Chain Management in a Developing Context: An Empirical Examination of Antecedents and Consequences
Mohamed Gamal Aboelmaged (2012). *International Journal of Social Ecology and Sustainable Development (pp. 22-41).*
www.irma-international.org/article/sustainable-supply-chain-management-developing/69538

Simulation and Optimization of Solar Domestic Hot Water Systems
Jamal Mabrouki, Mourade Azrour, Amina Boubekraouiand Souad El Hajjaji (2022). *International Journal of Social Ecology and Sustainable Development (pp. 1-11).*
www.irma-international.org/article/simulation-and-optimization-of-solar-domestic-hot-water-systems/315309

Towards a Competitive Sustainable City: Cycling as an Opportunity
Donatella Privitera (2015). *Handbook of Research on Sustainable Development and Economics (pp. 20-36).*
www.irma-international.org/chapter/towards-a-competitive-sustainable-city/130922

Organizational Support for Professionalism, Organizational Citizenship Behavior (OCB), and Performance
Noviana Norrohmat, Umar Nimran, Kusdi Raharjo, Hamidah Nayati Utamiand Endang Siti Astuti (2021). *International Journal of Sustainable Economies Management (pp. 1-12).*
www.irma-international.org/article/organizational-support-for-professionalism-organizational-citizenship-behavior-ocb-and-performance/277202

Food and Environment: A Review on the Sustainability of Six Different Dietary Patterns
Pedro Pinheiro Gomes (2018). *Food Systems Sustainability and Environmental Policies in Modern Economies (pp. 15-31).*
www.irma-international.org/chapter/food-and-environment/200087