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Digitizing the Agri-Food Industry: The METROFOOD-IT Integrated Approach to Enhancing Food Quality, Safety, and Sustainability with Information and Communication Technology

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Information and Communication Technology (ICT) has recently permeated various sectors, such as economics and medicine. However, the agri-food industry, which integrates agriculture, food processing, and distribution, has been slower in embracing these advances. The agri-food industry represents a critical sector in the global economy, contributing significantly to employment, trade, and food security. It is tasked with meeting the growing demands of an expanding population for superior-quality food products.

In response to the digital advancements in agri-food systems, the World Trade Organization (WTO) has implemented new regulations. Furthering this commitment to innovation, METROFOOD-IT, an Italian Research Infrastructure (RI), was created focusing on food metrology and open-access data. Affiliated with ESFRI METROFOOD-RI for Health and Food, METROFOOD-IT is designed to boost the innovation and sustainability of agri-food systems by integrating electronic and physical components of the RI. The aim is to cultivate a collaborative ecosystem that fosters research and innovation, involving all agri-food systems stakeholders, such as businesses, the scientific community, and consumers.

METROFOOD-IT offers advanced services for various user categories, access to different physical facilities like laboratories, and electronic resources, including applications that adhere to FAIR (Findable, Accessible, Interoperable, and Reusable) principles. The ultimate goal is to enhance the digitization of the agri-food system, focusing on food quality and safety, traceability, transparency, sustainability and resilience, and the promotion of a circular economy.

Our proposed architecture focuses on managing data related to the quality and safety of the food supply chain. This system involves the electronic infrastructure (e-RI), including sensors, to capture quality metrics. These sensors are integrated with various technologies such as the Internet of Things, Blockchain, Artificial Intelligence, and Cloud Computing, all of which contribute to data and quality management. This sophisticated framework fosters interactions among these technologies, enabling a seamless and efficient agri-food system.

Keywords: agrifood, food metrology, FAIR guidelines, blockchain, artificial intelligence

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