

# INDUSTRY 4.0 CHALLENGES FACING THE AGRI-SUPPLY CHAIN: A LITERATURE REVIEW

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## ABSTRACT

The world is moving fast, and organizations are facing new risks, uncertainties, and threats within their supply chains. Food security, waste minimization, and sustainability are new strategic requirements agri-organizations must address and focus on. Nevertheless, due to globalization and changes in the market post-COVID-19, supply chains are becoming more complex and agri-organizations must change their business processes and operations to become more competitive, responsive, and agile.

To be more customer-oriented, efficient, and sustainable agri-organizations have been adopting new innovative technologies such as RFID and Internet of Things. Recently, the concept of Industry 4.0 (I4.0) has gained significant attention from specialists, academics, and decision-makers. I4.0 technologies can enhance supply chain performance by bringing new cost-effective, green lean features and solutions that can improve internal and external event traceability, process automation, waste management, data sharing, and KPIs monitoring. However, there are many challenges to the adoption of I4.0 technologies. Therefore, it is very important to study these challenges facing the agri-supply chain.

The main aim of this research is to analyze the literature in a systematic approach to highlight and identify the challenges agri-supply chains are facing while deciding on implementing I4.0 technologies. Using a set of 64 publications, including journal papers, conference papers, reviews, and books chapters, selected from the well-known database Scopus for the last 7 years, a systematic literature review was conducted. The SLR highlights and considers several I4.0 technologies and their applications affecting the agri-supply chain.

The results of this study are based on a thorough analysis of the added-value outcomes of implementing different I4.0 technologies in the agri-food supply chain. Over a dozen challenges are remarked in the literature. These challenges are categorized into 3 main areas in the agri-food supply chain: infrastructure, technical and operational. The most critical challenges detected -with most observations- are technological architecture, security and privacy, and internet and IoT-based infrastructure.

## METHODOLOGY

Systematic literature review (SLR) is a structured methodological technique to reach a profound understanding and insights about specific topics (Briner and Denyer, 2012). SLR has become one of the main methodologies applied for evidence-based practice (Hohenstein et al., 2015). This study examines published literature by applying an SLR approach adapted from the five-step guideline by Garza-Reyes (2015).

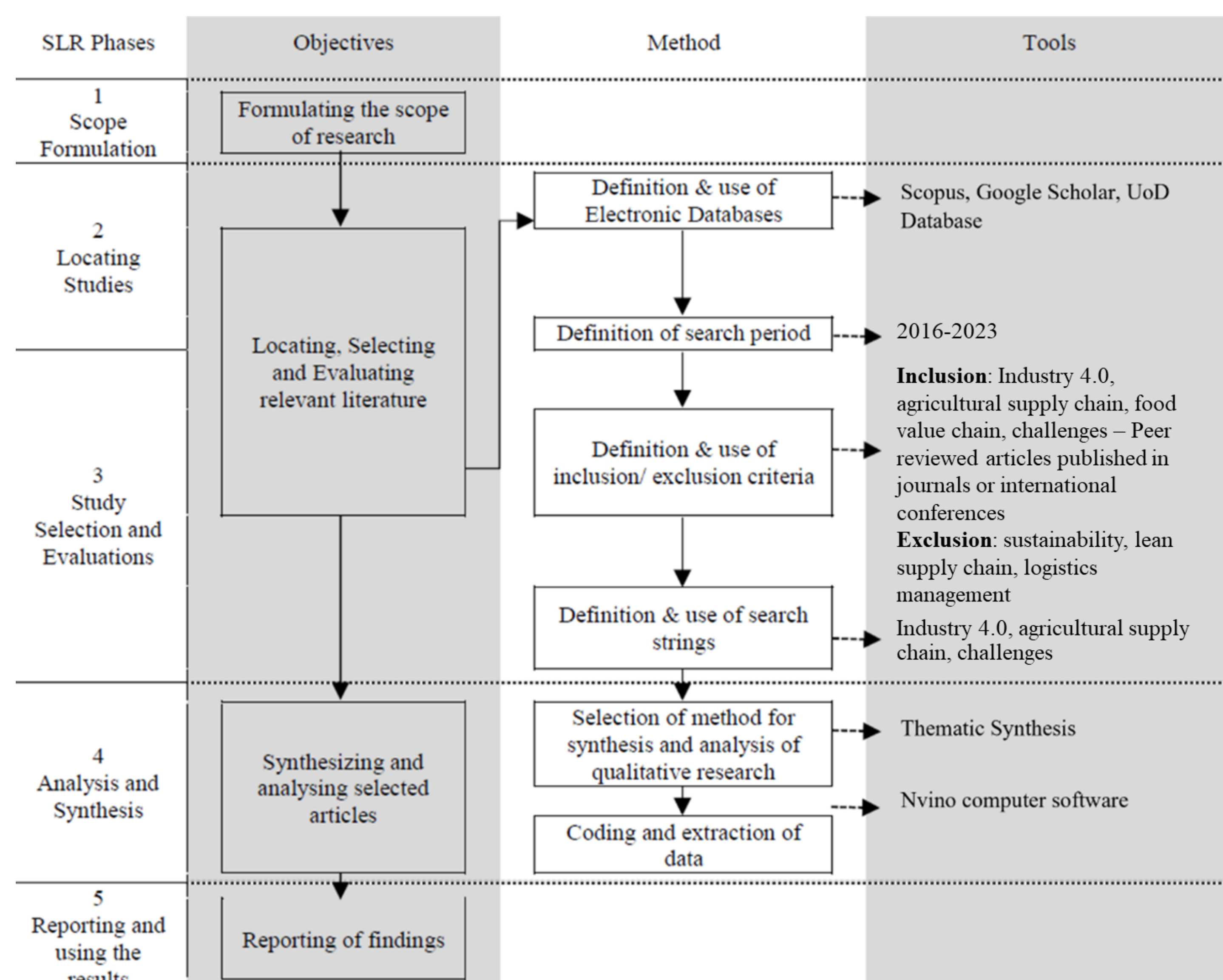
Scopus, Google Scholar and University of Derby database were the three different databases to be used in searching for related literature, to guarantee that all related research papers are included (Crossan and Apaydin, 2010). The most important and essential issue to carry out queries in databases is the identification of keywords that allow classifying all papers that are related to the research goals.

The keywords were split into two groups as follows:

Group 1 keywords include general terms linked to industrial revolutions and innovative technological processes, i.e.: **Industry 4.0, Industry 5.0, Supply Chain Innovation.**

Group 2 keywords include more specific words related to Agri-Supply Chain challenges, i.e.: **agri-supply chain, agricultural supply chain, agricultural value chain, food supply chain, food value chain, challenges, limitations and barriers.**

After running the queries using group 1 keywords total of **337** publications were found. Then when combined with group 2 keywords, we recovered 92 papers in total from all databases, after checking for duplication and selecting only papers written in English. The significance of the papers found was assessed by checking the titles and abstracts of the papers, to disregard those papers that did not meet the inclusion criterion. Only papers in peer-reviewed academic journals and international conferences were retained reducing the total number of papers to **64**.



## RESULTS



### Infrastructural Challenges

Security and privacy  
Wireless power transfer and ambient energy harvesting  
Big data management  
Reliability, availability, and robustness  
Developing IoT-based cloud system  
Technological architecture

### Technical Challenges

Internet and IoT-based infrastructure  
Governmental regulations  
Standardization

### Operational Challenges

Energy consumption  
Interoperability and scalability  
Implementation and running costs  
Human skills and lack of training

## CONCLUSION

The major obstacle that the agri-food sector must overcome in order to integrate industry 4.0 into their supply chain is proper infrastructure like the internet. Additionally, this study portrays a thorough classification of challenge themes that aids practitioners and academics in focusing their attention on solving the issue at hand and in having a better grasp of all the issues at once.

Addressing these challenges requires collaboration between various stakeholders, including government bodies, technology providers, industry associations, and farmers themselves. By investing in research, infrastructure, education, and supportive policies, the agricultural industry can overcome these challenges and harness the benefits of Industry 4.0 technologies for a more efficient and sustainable supply chain.

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