Comprehensive Literature review:

Enhancing Food Supply Chain Management through Big Data technologies and strategies

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MBAR 661: Academic Research Project (ONS-SPRING24-02)
(Under the Supervision of Dr. Amit Kohli)

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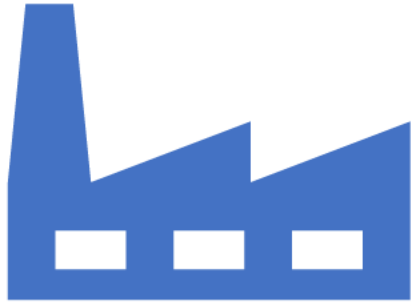
A Food Supply Chain Management (FSCM) goes through series of activities where products are taken from their origin to their final sale to customers (Rejeb et al., 2022).

Big Data refers to extremely large datasets that are too massive and often characterized by "3 V's" Volume, Velocity and Variety (Tao et al., 2015). Big data analysis can give insights, identify trends and make informed decision in Food Supply Chain
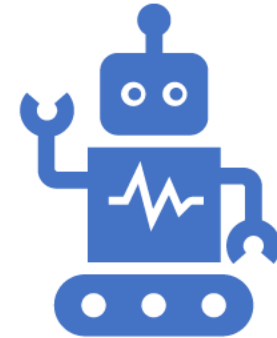
Problem Statement
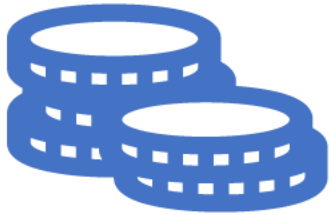
Critical Role of Food Supply Chain Management in global economy; scalability issue

Issues with inefficiencies, in forecasting and logistics often lead to massive food wastage

Limited adoption and outdated practices

Research Questions

RQ1: What are Big Data applications, technologies and strategies currently available for improving supply chain management?

RQ2: How can Big Data technologies and strategies be applied to different stages of the supply chain?

Literature Review Overview

Focuses on Sources of Big Data

Internet of Things, Blockchain, Artificial Intelligence to highlight potential for improving efficiency, traceability and sustainability in supply chain

Inclusion and Exclusion Criteria: English, Online, 2015-2024, Papers/Articles/Journals (324 Selected – 310 Retained)

Keywords: "Big Data", "Food Supply Chain", "Food Supply Chain Management", "Food Logistics", "Data Analytics"
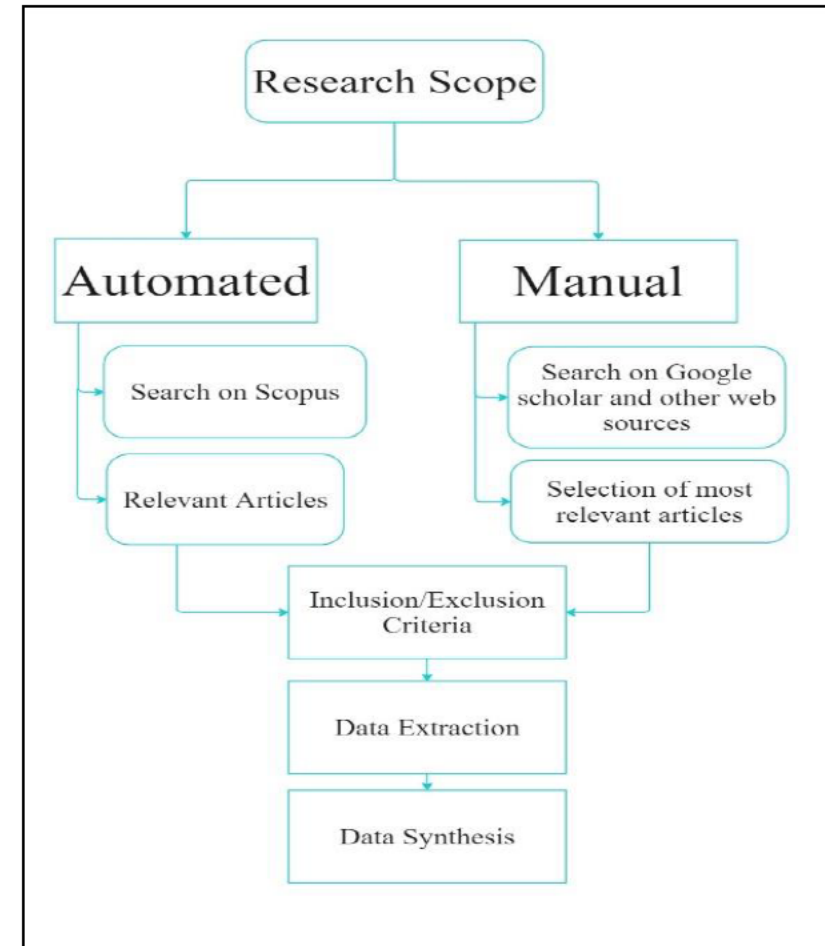
(Kitchenham and Charters, 2015)
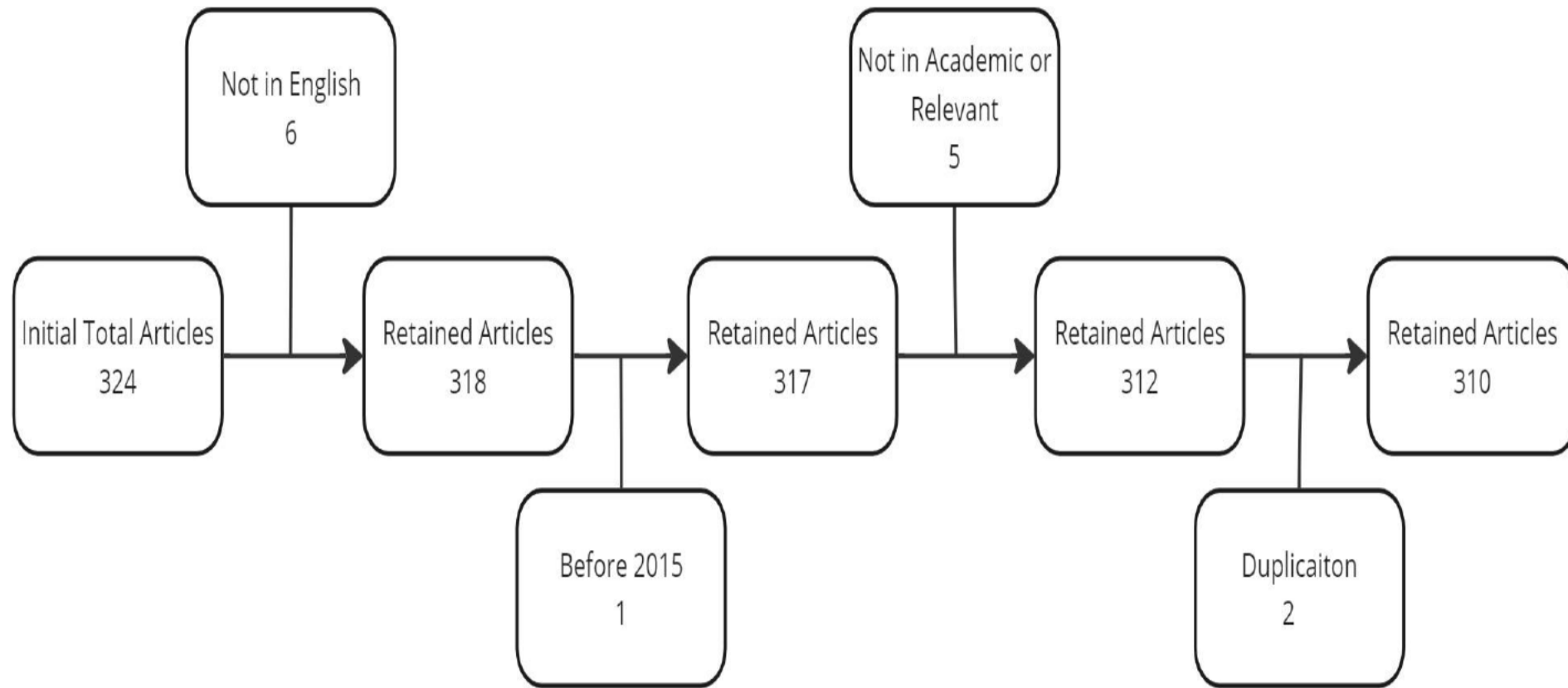
Research Methodology

Systematic Literature Approach

Selection Criteria and databases: Scopus, Web of Science, Google Scholar
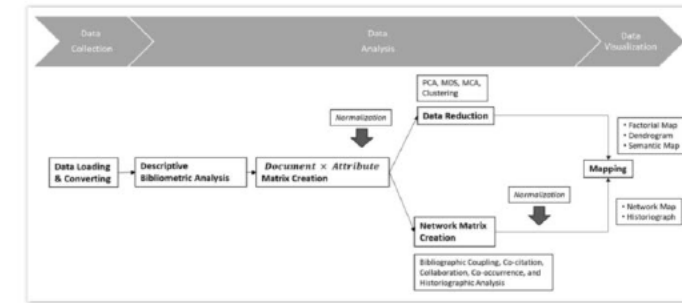
Analysis Method: Thematic, Content, Bibliometrix

Inclusion/Exclusion Applied (Protopop, 2016)

Bibliometric Analysis

(Aria and Cuccurullo, 2017)

From Data Collection to Data Visualization

The package starts from the download of the data from different bibliographic databases (for a complete list, see the correlated section). Starting from the upload of the data, it is possible to perform the analysis, also with proper and dynamic graphs.

Main Information

R studio

Plot   Table

|			
Timespan 2015:2024	**Sources** 147	**Documents** 217	**Annual Growth Rate** 23.12 %
Authors 702	**Authors of single-authored docs** 26	**International Co-Authorship** 29.95 %	**Co-Authors per Doc** 3.53
Author's Keywords (DE) 685	**References** 0	**Document Average Age** 3.22	**Average citations per doc** 28.18

Thematic Map

- Visual representation of key research themes in FSCM

- Shows connections between technologies and supply chain stages

- Highlights major area of focus
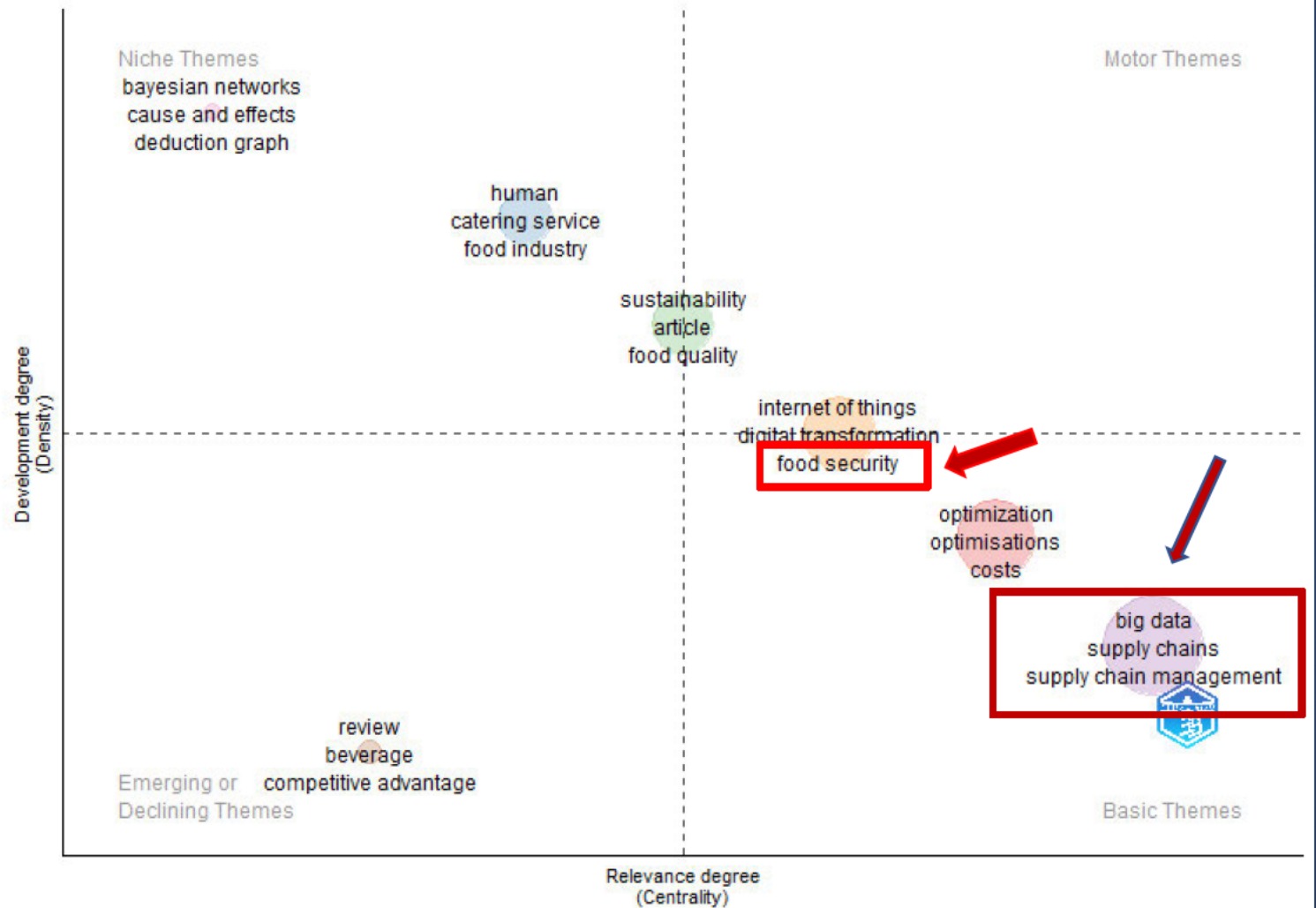
Word Cloud

Visual representation of the most frequently occurring terms in the literature
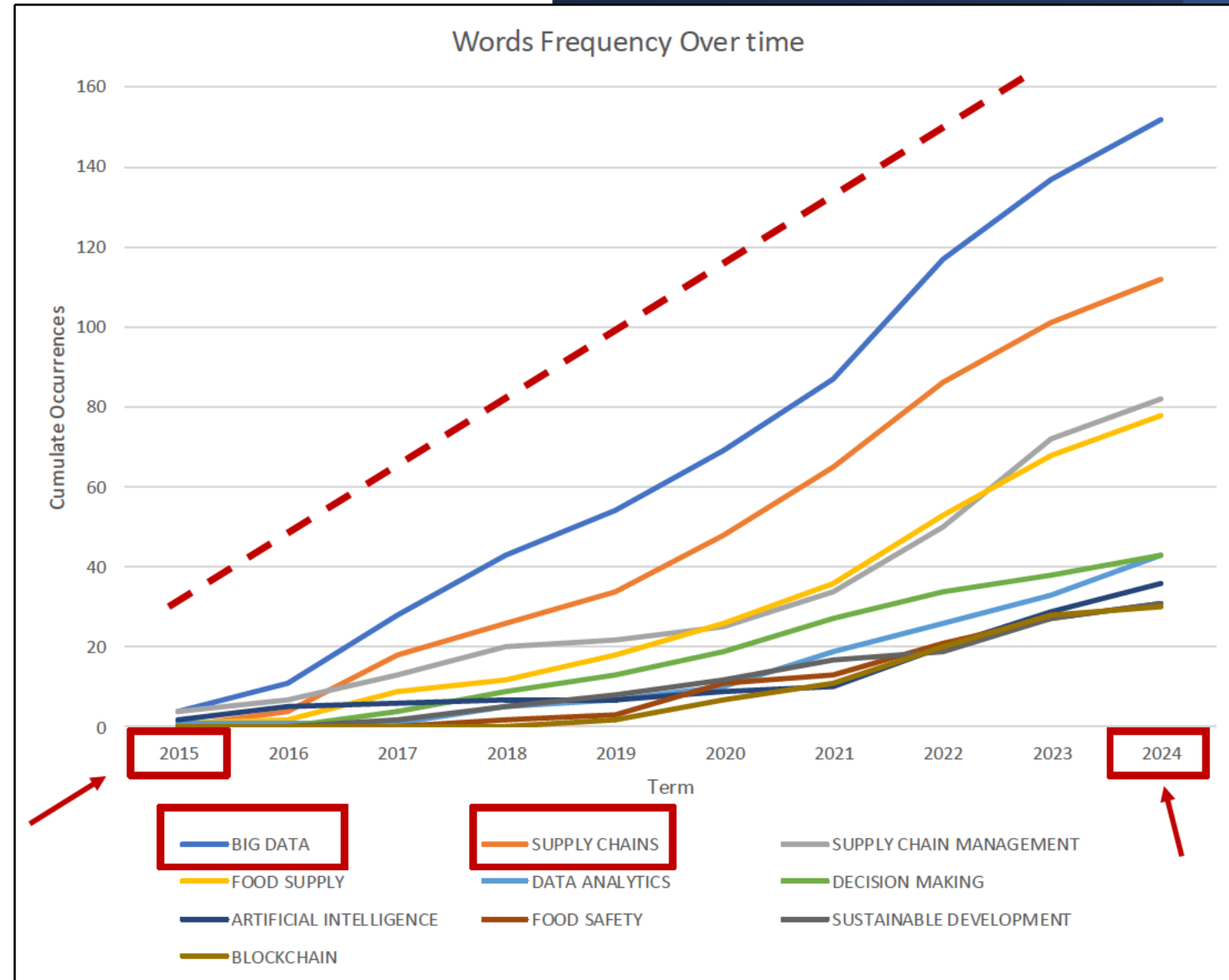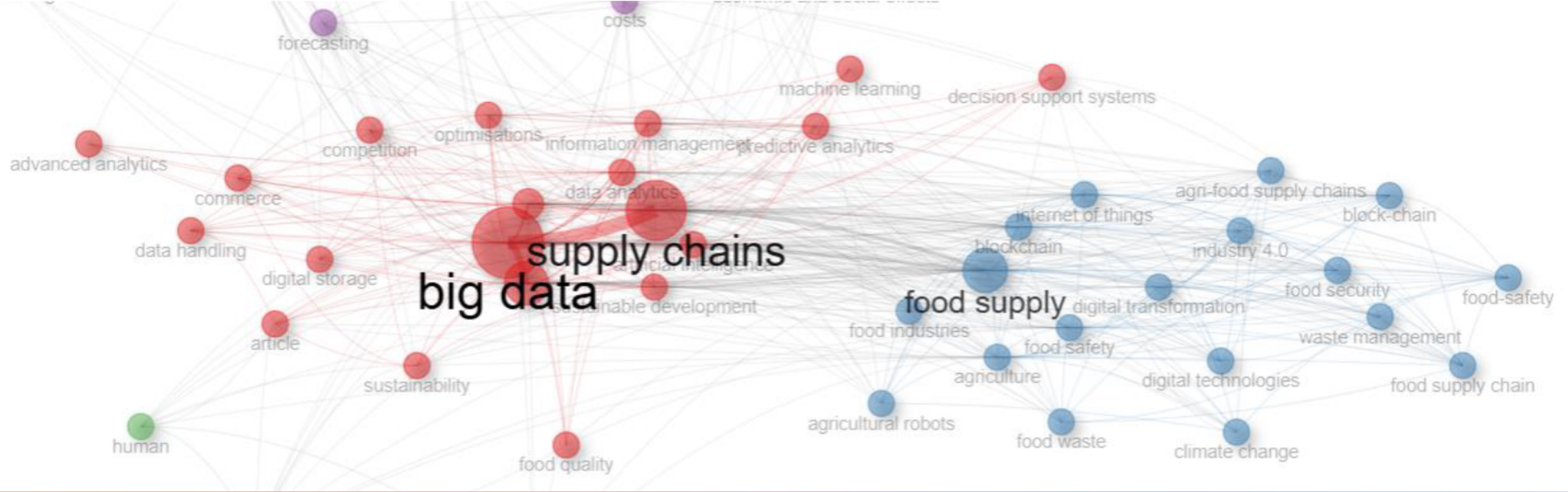
Highlight key topics such as Big Data, Supply Chain, Food Supply, Food Safety

Cumulative Occurrence

- Tracks the frequency of key themes over time

- The graph Shows "Big Data" leads with 152 occurrences, while "supply chain" follows with 112.

Words Frequency Over time

Co-occurrence Network

- Illustrates the relationship between frequently paired keywords in the literature

- The visualization underscore the strong connection between "Bid Data" and "Supply Chain" and "Food Supply" reflecting their crucial roles in modern business strategies and operational efficiency across various industries.

Trend Topic Analysis

Analyze the evolution of key topics in FSCM over time

Identifies emerging trends and shifts in research focus towards advanced technologies
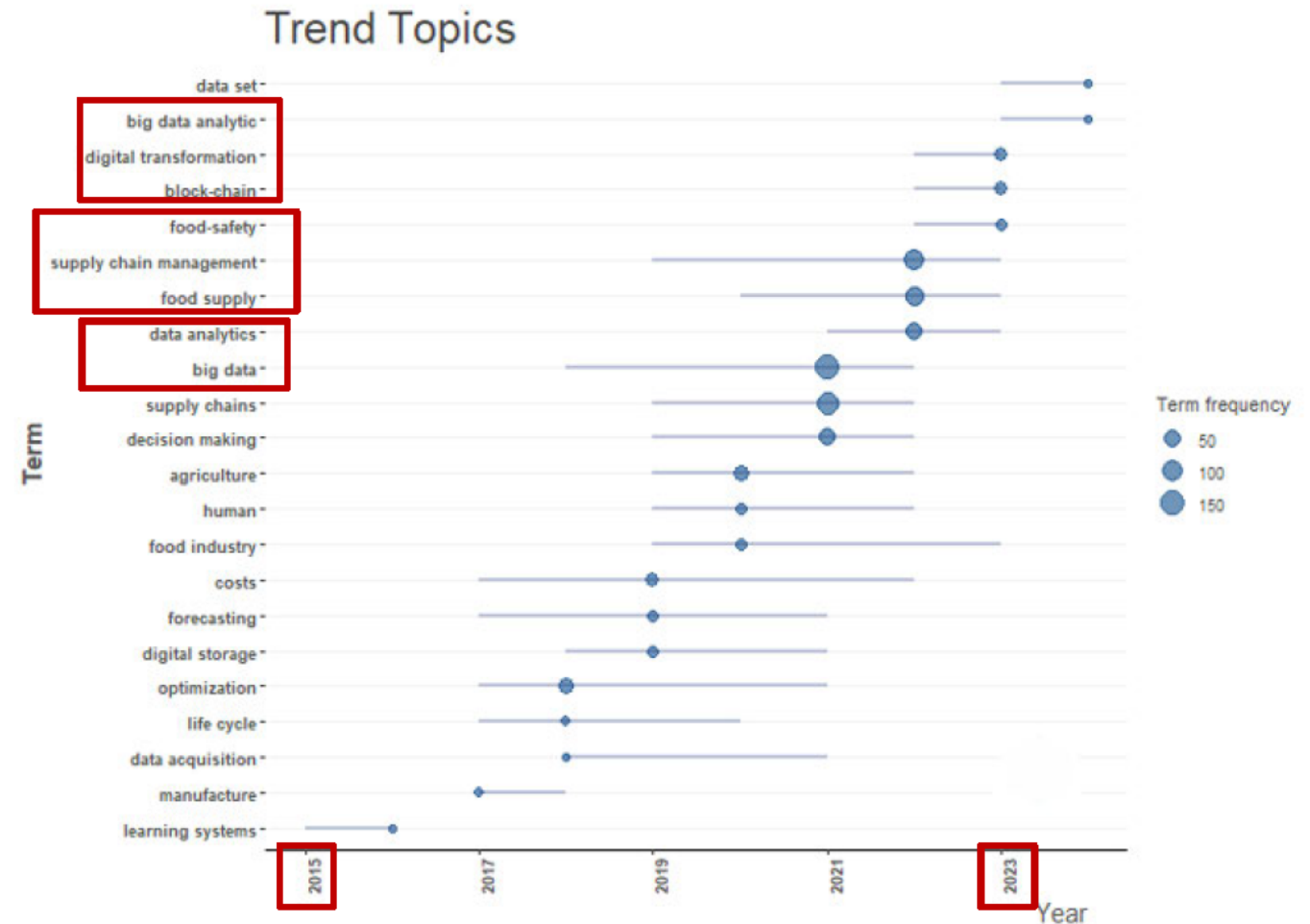
Annual Scientific Production

- Displays the number of research publications per year

- Shows the growth in scientific interest and research output in FSCM
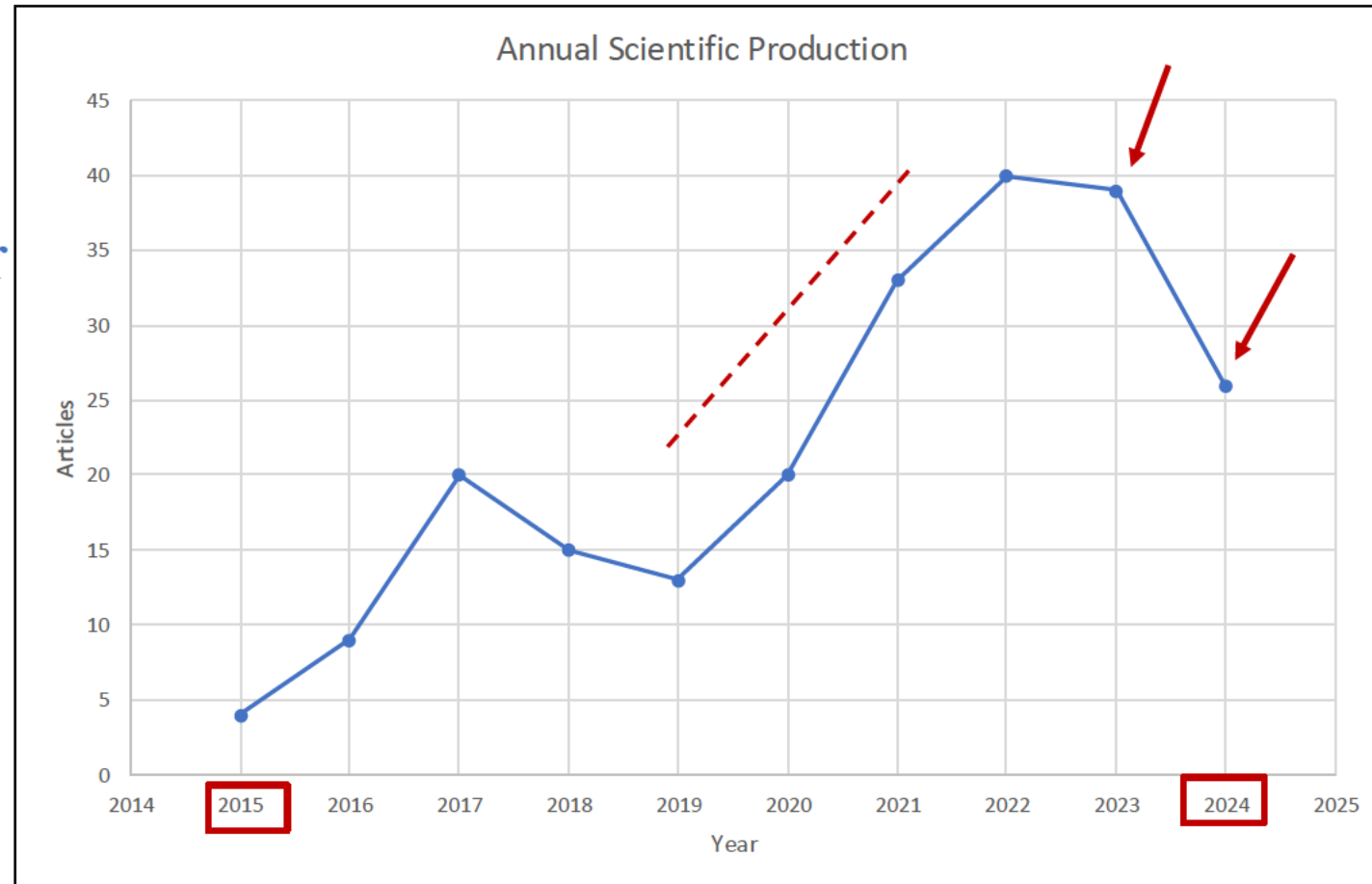
Tree Map

- Visual representation of the distribution of research topics

- Highlights the prominence of key areas like Big Data and Food Supply chain followed by IoT, Blockchain and AI in FSCM.
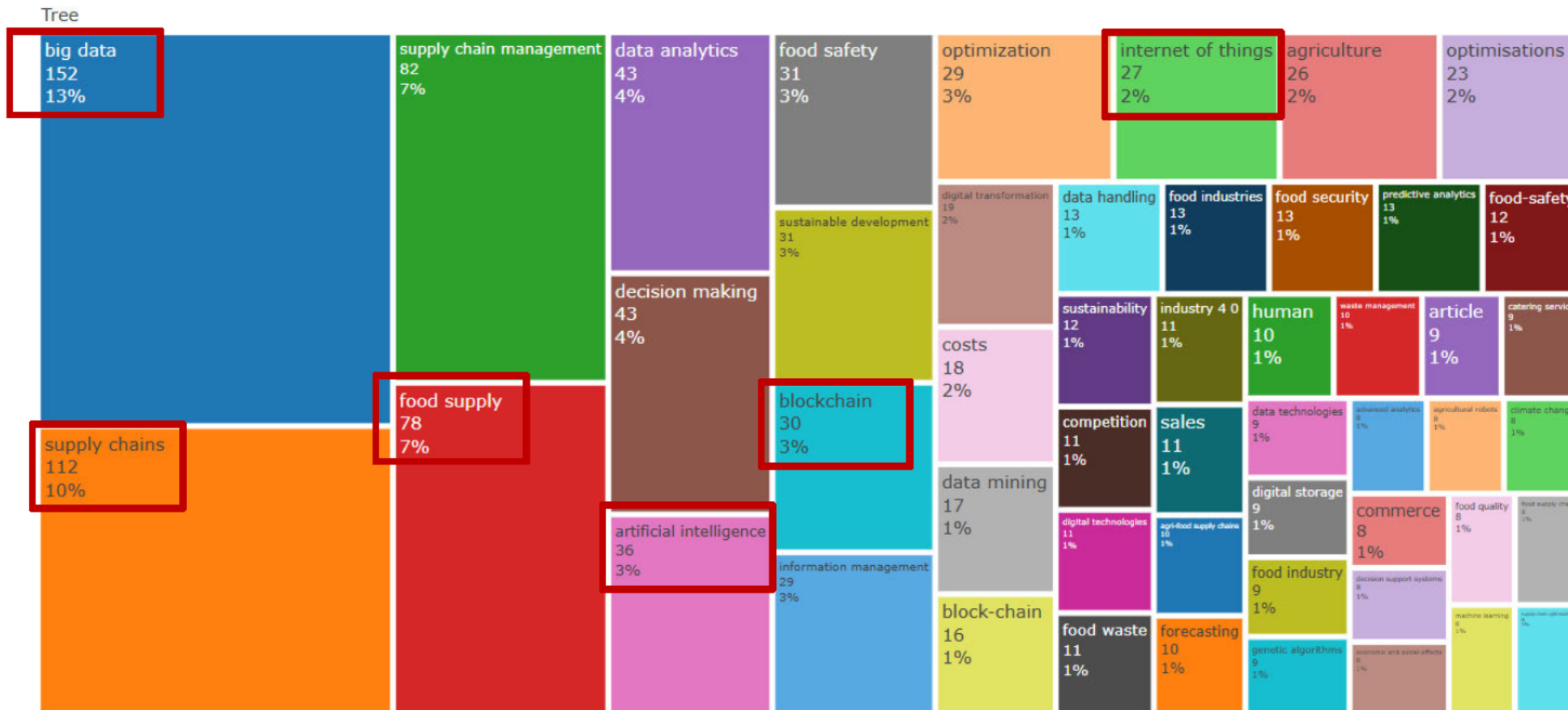
Research Question 1

What are the current Big Data application, technologies in Food Supply Chain Management (FSCM)?

Key findings

- Internet of Things

- Blockchain in Food Supply Chain

- Artificial Intelligence

- Smart Agriculture

Internet of Things (IoT)

IoT

(Lezoche et al., 2020)

Provides real time monitoring and data collection; Walmart

Enhanced traceability and decision making; IBM Food Trust

Integration with Blockchain; Te-Food

Quality Management; Danone

Blockchain in FSC

Increases transparency and security in FSCM (Rogerson and Parry, 2020)

Tracks food origin, quality, and transactions

Benefits for consumers, suppliers and regulatory compliance

BLOCK CHAIN

Smart Contract

E-Ledger
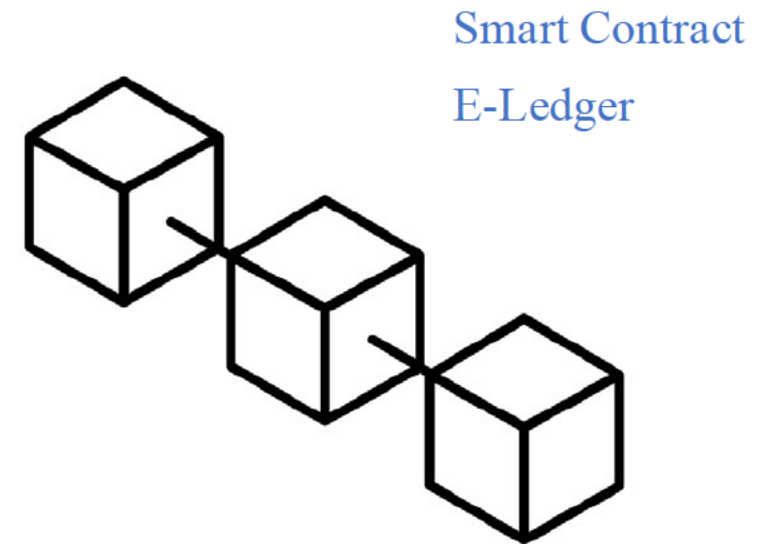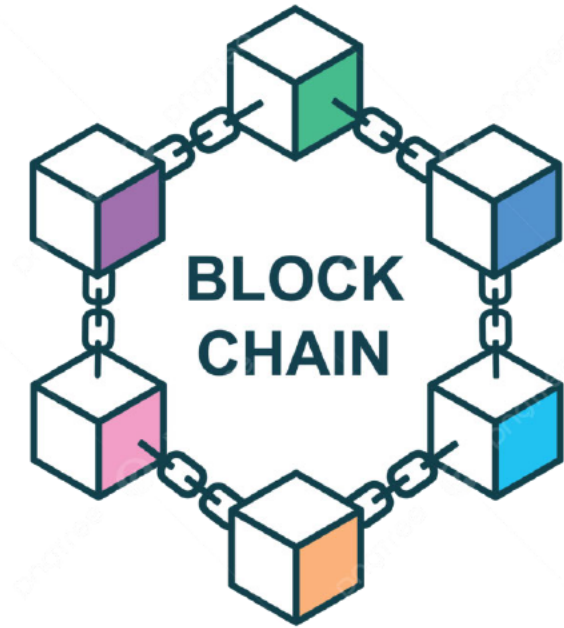
Artificial Intelligence

Enhances Predictive analytics for demand forecasting and inventory management

Automates decision making processes to optimize supply chain operations

AI addresses $750 billion in annual food waste by improving forecasts and enhancing traceability, ensuring food safety and sustainability (Misra et al., 2020)

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Smart Agriculture

Collaboration is Key: Fosters partnerships among farmers, tech suppliers, and stakeholders (Senturk et al., 2023)
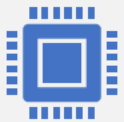
Big Data at the Core: : IoT devices and smart sensors gather vast amounts of data (Kumar and Dwivedi, 2023)

Seamless Integration: Big Data enhances traceability and transparency (Senturk et al., 2023)

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Research Question 2

How can Big Data technologies be applied across different stages of the food supply chain?

Using Big Data in the Agriculture Supply Chain

Using Big Data to Increase the Efficiency of the Food Supply Chain

Using Big Data to the Food Supply Chain to manage food quality

Utilizing Big Data to reduce food losses throughout the Food Supply Chain

Utilizing Big Data Applications in Urban Food Supply Chain

Use of Big Data in Agriculture Supply Chain

Enhances through Precision Agriculture and Smart Farming techniques

Improve agriculture resource management with IoT sensors and Big data analytics – 15% Improve in Crop Yields (Coble et al., 2018)

Reduces waste and environmental impact by optimizing inputs and monitoring crop health

Increase efficiency of Food Supply Chain

by 10-15% (Ahmadzadeh, 2023)

Leverage	Leverage Big Data for better demand forecasting and streamlined distribution
Implement	Implement IoT for real time monitoring and traceability
Use	Use AI and Machine Learning to optimize logistics and reduce waste

Manage Food Quality

01

Implement IoT sensors for real time monitoring of storage and transport conditions

(Donaghy et al., 2021)

02

Use Blockchain for traceability and verification of food origin and handling

(Tejero et al., 2019)

03

Apply AI for quality control and early detection of defects or contamination

(Antonucci et al., 2019)

Reduce Food Losses

Food loss is a critical issue with a direct impact on global sustainability

Estimated that 46% to 65% of food waste happens at the consumer level, but significant losses also occur during production and distribution (Annosi et al., 2021)

Due to the overproduction of food that does not align with market demand

Food wastage: Statistics & impacts

Drivers of food waste

Learning from history

FOOD LOSS & FOOD WASTE

Why consumers waste food

Moving forward: Towards a better future

Food waste generation and re-use

Reduction and avoidance of food waste

Urban Food Supply Chain
(Mantravadi, 2023)
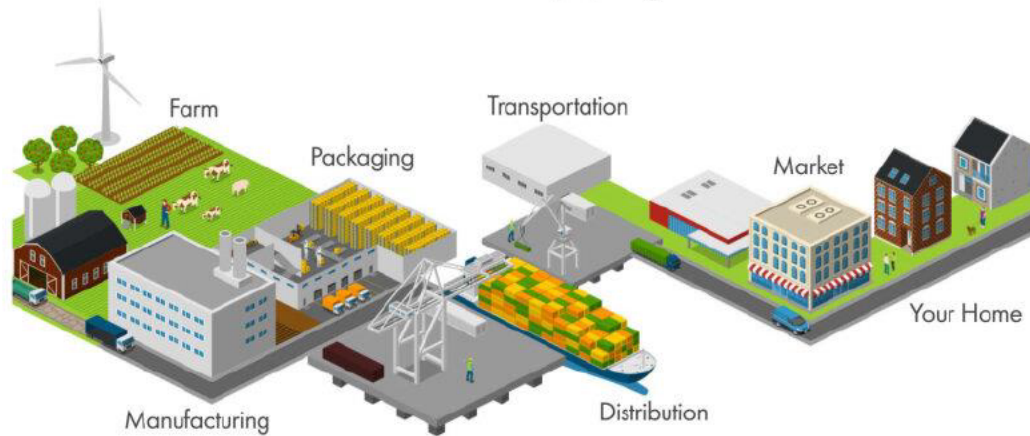
Focus on localized sourcing and urban farming to reduce transportation distances

Use smart logistics and distribution networks to meet high urban demand

Enhance food access and reduce waste through efficient inventory and delivery systems

Urgency of Research
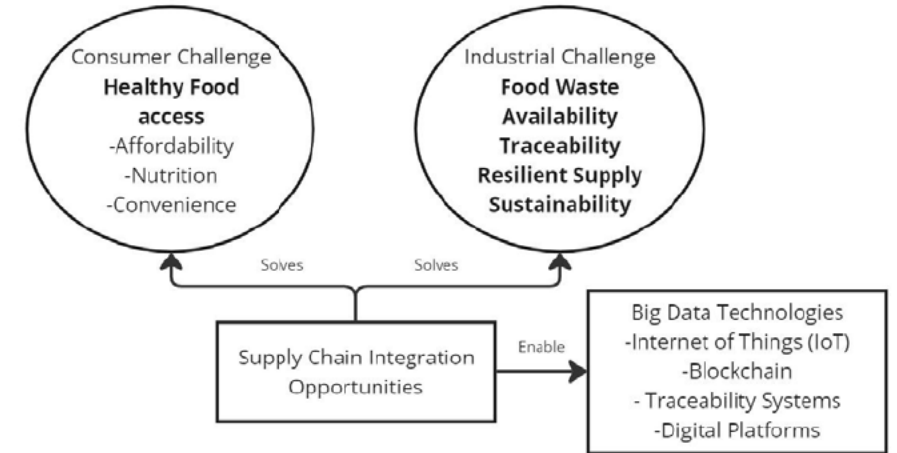(Guangjie et al., 2023)

Immediate need for digital transformation in FSCM

Global Pressures: climate change, population growth

600 illnesses and 42,000 deaths each year due to unsafe food

Unsafe food cause 200+ illnesses from diarrhea to Cancer
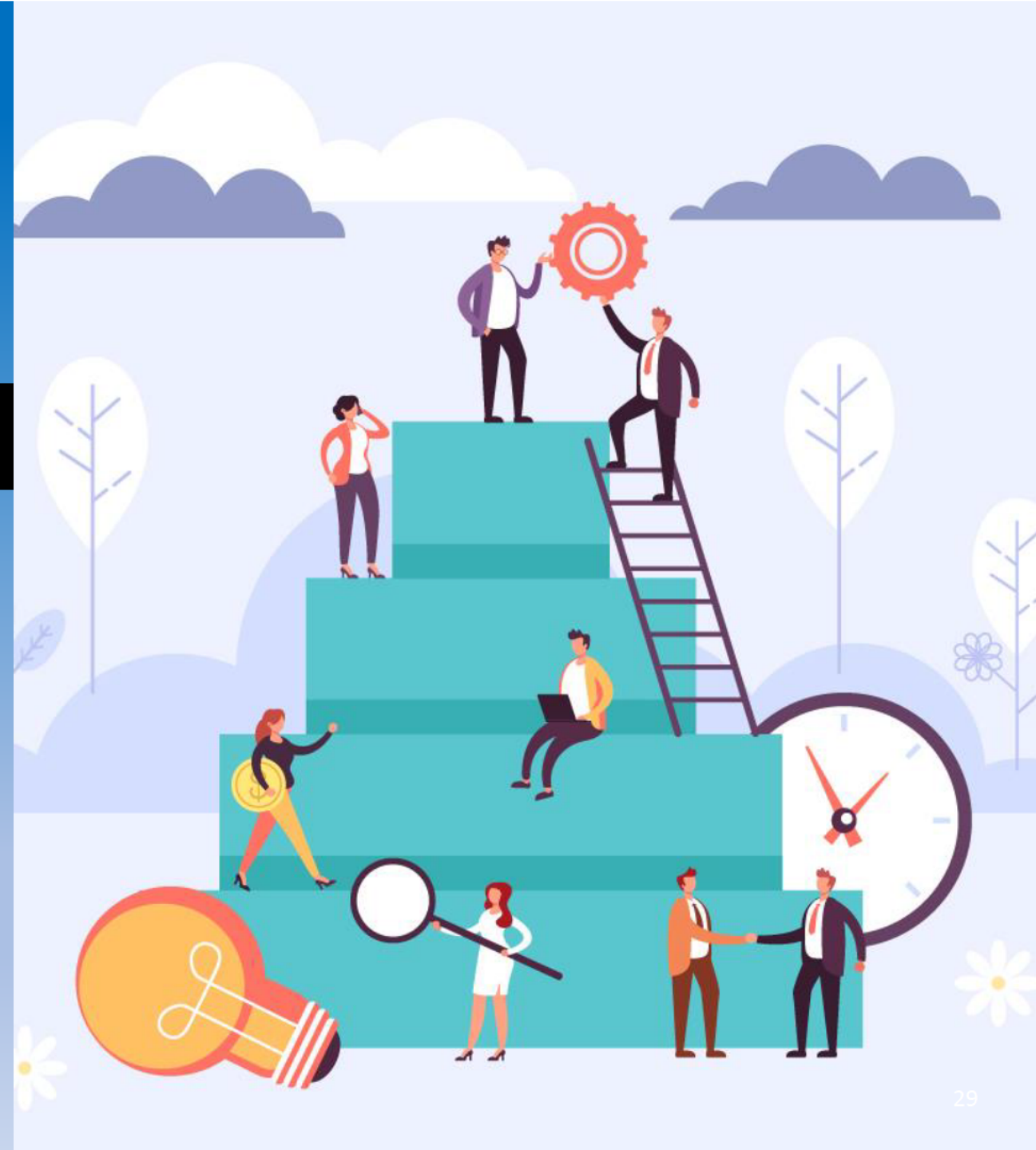
Recommendation

- Pandemic has undoubtedly brought new era on a global scale in the operation of Food Supply Chain

- Encourage Investment by Small and Mid-sized companies, invest in small tools like Tableau, Power BI or around $5000 a month

- Return on Investment is Significant.

- We have practical outcomes: Australian company reduced food wastage by 30%

- Be more efficient and sustainable

Conclusions

Recap of key findings and significance

Transformative potential to solve critical challenges

Call for collaborative efforts among stakeholders

Implications for Practice

(Mantravadi, 2023)

Practical implications for FSCM practitioners

How businesses can implement Big Data Technologies

Enhancing food supply chain performance and sustainability
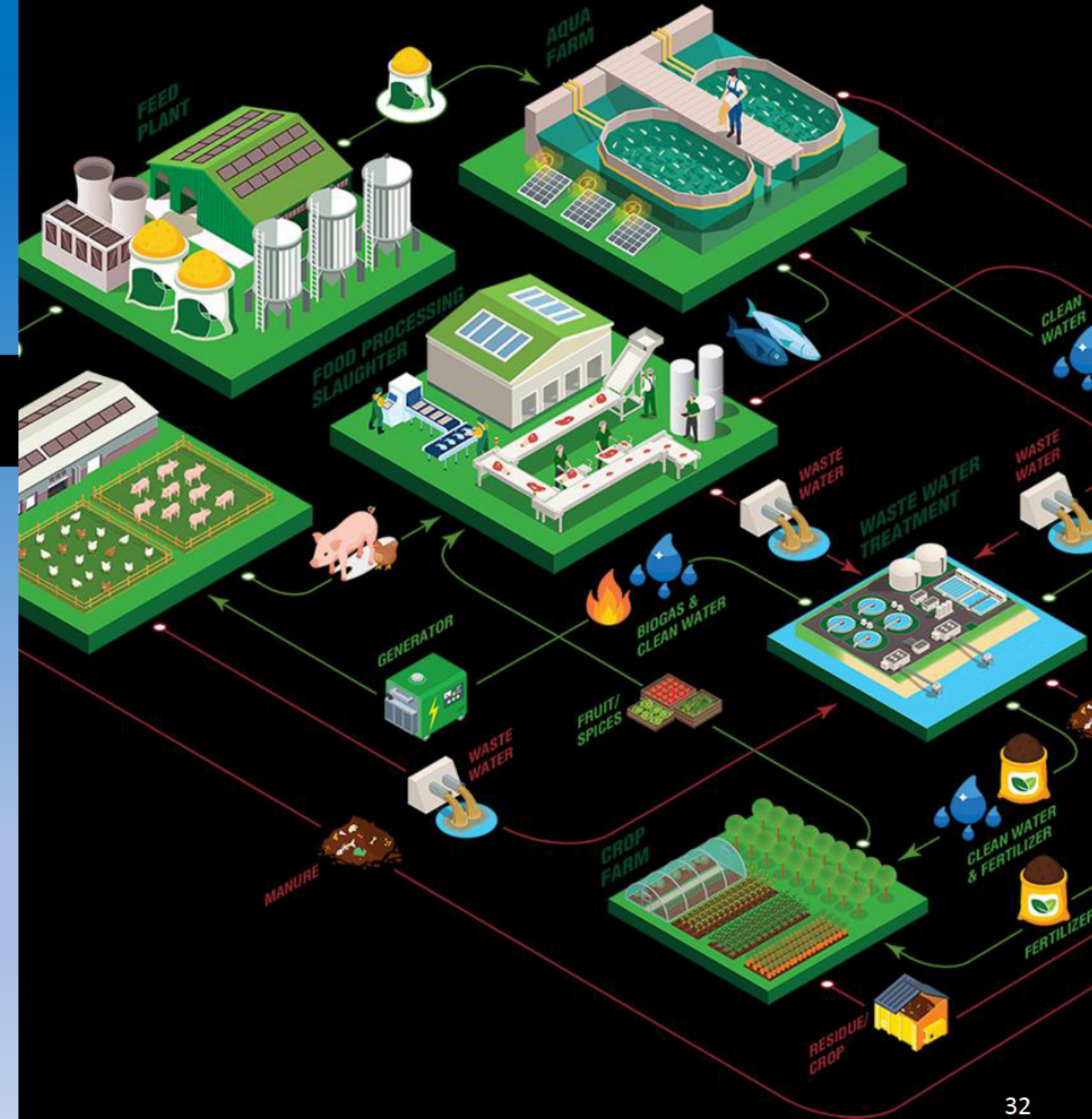
Future Research
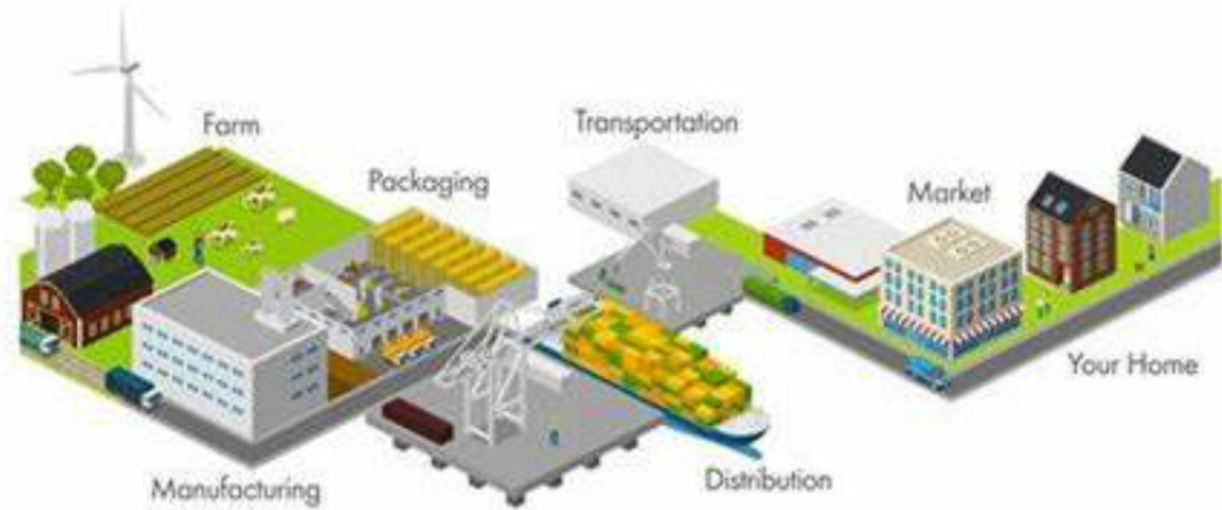
Explore Newer Technologies : Neural Networks, AI, Cloud Computing

Focus On Cost Effective Solutions For SMEs

Need For Globally Representative Studies

Limitations

Geographical and methodological limitations

Need for broader, more diverse studies

Suggestions for future studies

Certificate

Publication

My research paper "Comprehensive Review: Enhancing Food Supply Chain Management through Big Data Technologies and Strategies" has been fully prepared and is now ready for publication.

It is currently in the review stage. The only remaining task is the formatting of references.

The paper is expected to be published in the Journal of Open Innovation: Technology, Market, and Complexity.

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