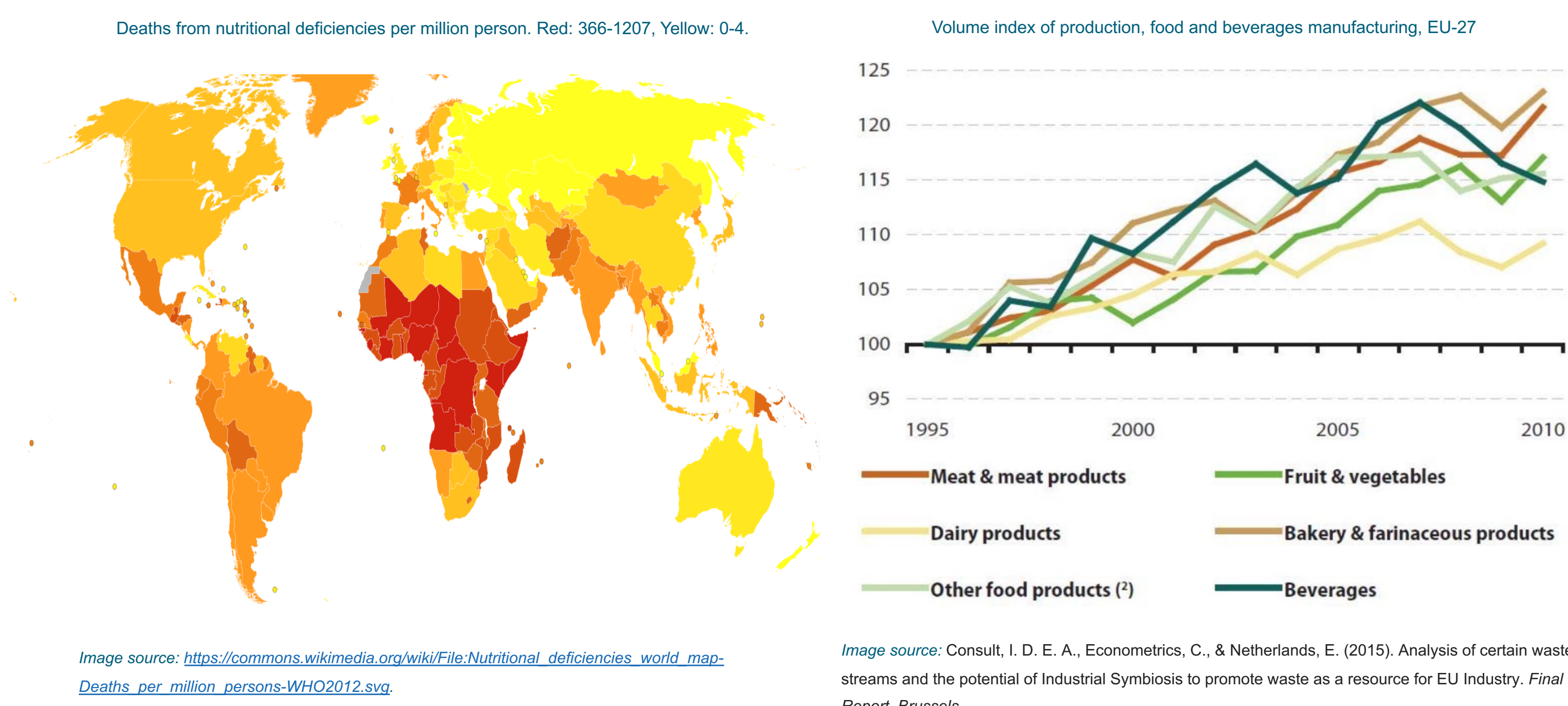


Designing Food Supply Chain for Nutrient Delivery and Traceability

| Garry Clawson | IRRG | Supervisor: Dr Mukesh Kumar | Advisor: Prof Chander Velu

Background

Over **3 billion** people cannot afford a healthy diet.^[1] Obesity has **tripled** since 1975 to over 2.6 billion people.^[2] Over **30%** of the world's population are anemic.^[3] Current per person food production exceeds **2750** kilocalories per day while the per person requirement is **2200** kilocalories.^[4] We successfully trace the volume not functionality. There is a global paradox of **undernourishment** and **overproduction**.

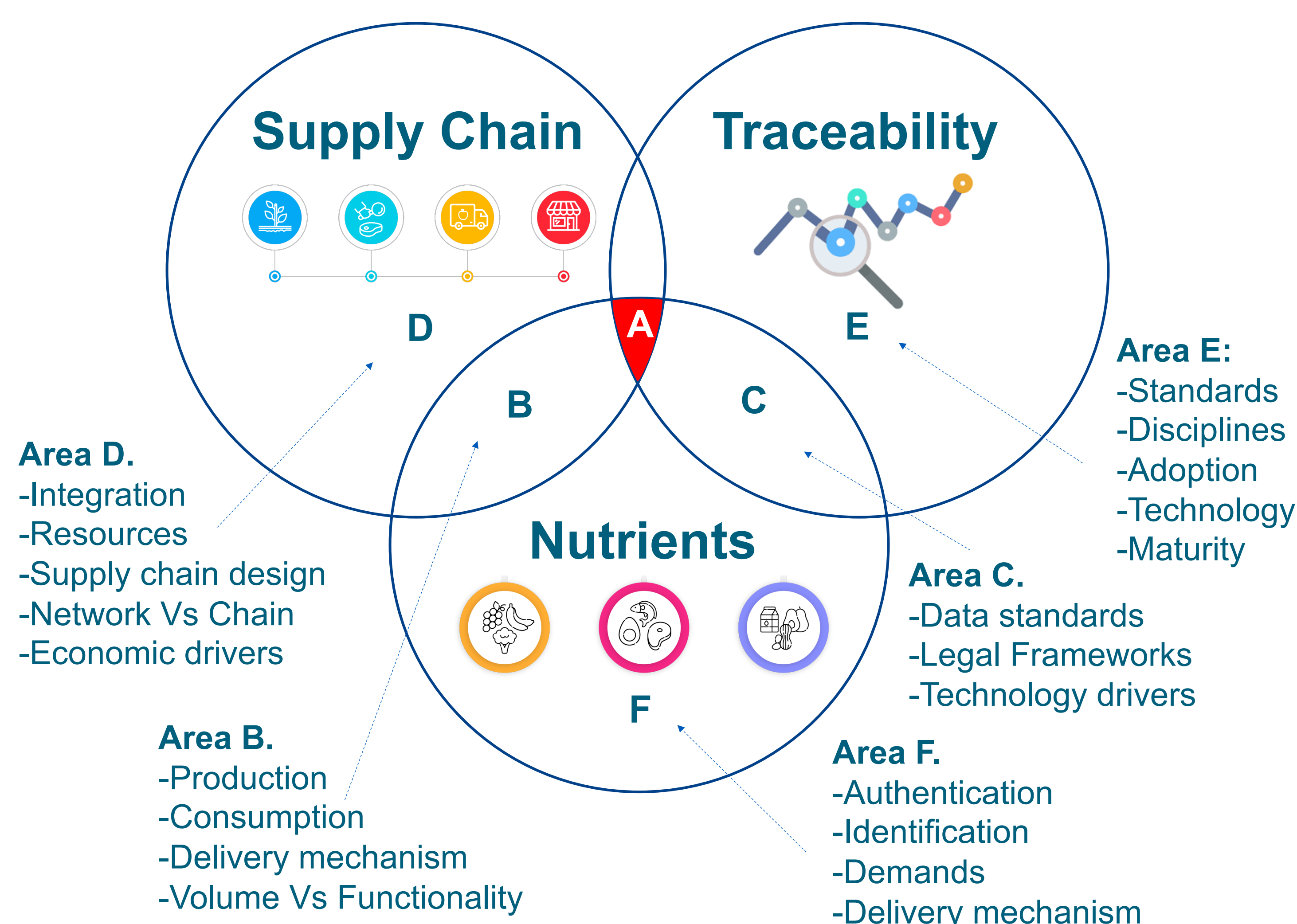


Challenge

- **Global challenge:** From mid 20th Century, **food supply chain** designed for **volume delivery** targeting **famine**, not **nutrient delivery**, targeting **health**
- **Traceability** models^[6] led by technological, societal, legal paradigms^[7] are **sparse, unspecific, reactive**. They are not adequate within **digital** supply chain lens
- **Academic challenge:** Food supply chain design from **raw material** and **technology** to product **functionality** perspective where there is very **limited** literature

Research Focus

3 Intersecting areas: extends **Configuration Theory**^[5]

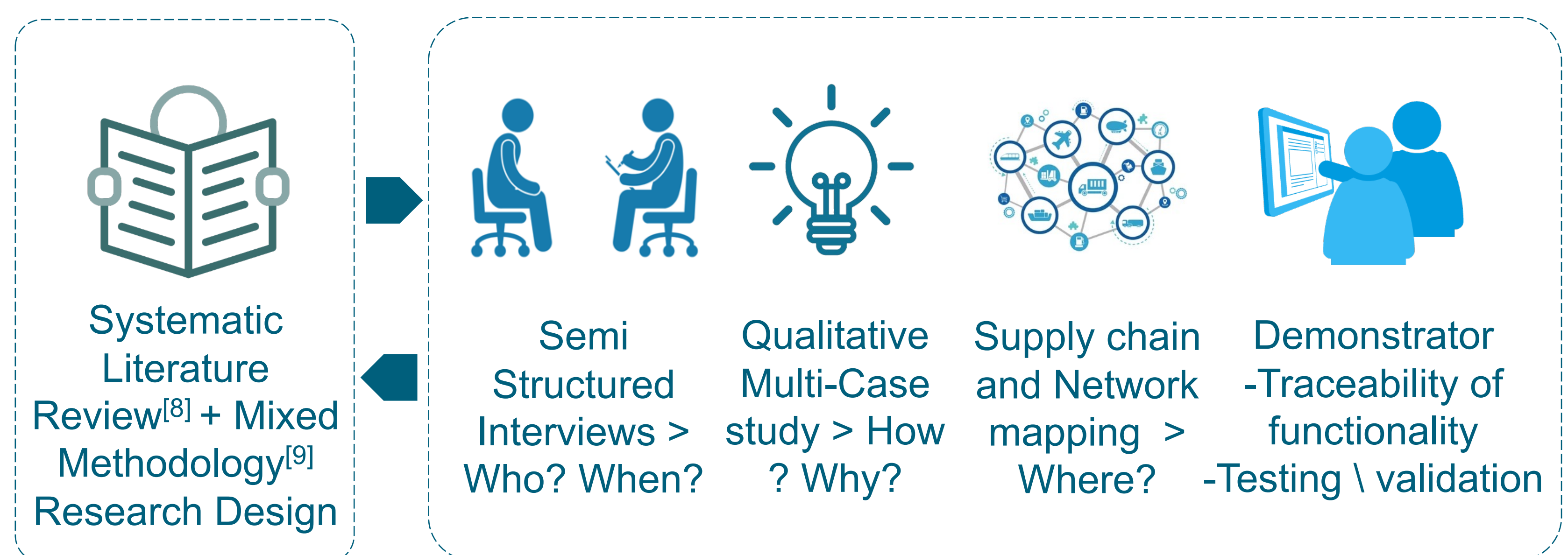


Research Questions

How can supply chain be designed to deliver product functionality?

- I. What are the design factors needed to be considered?
 - i. What technologies are required for the traceability of product functionality in an end-to-end supply chain?
 - ii. What are the different supply chain design taxonomies that support different types of functionality configuration?

Working Research Design



Part A: Focus on traceability system development for product functionality

Part B: Testing and validating through qualitative means / demonstrator

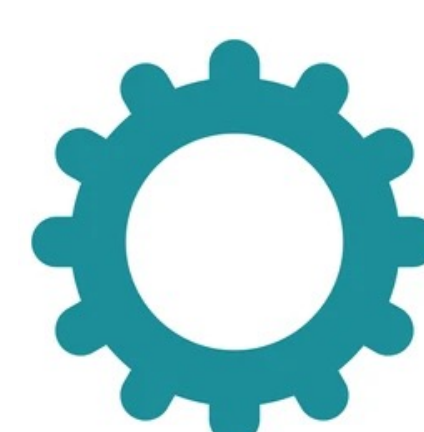
Contributions

Theoretical Contribution



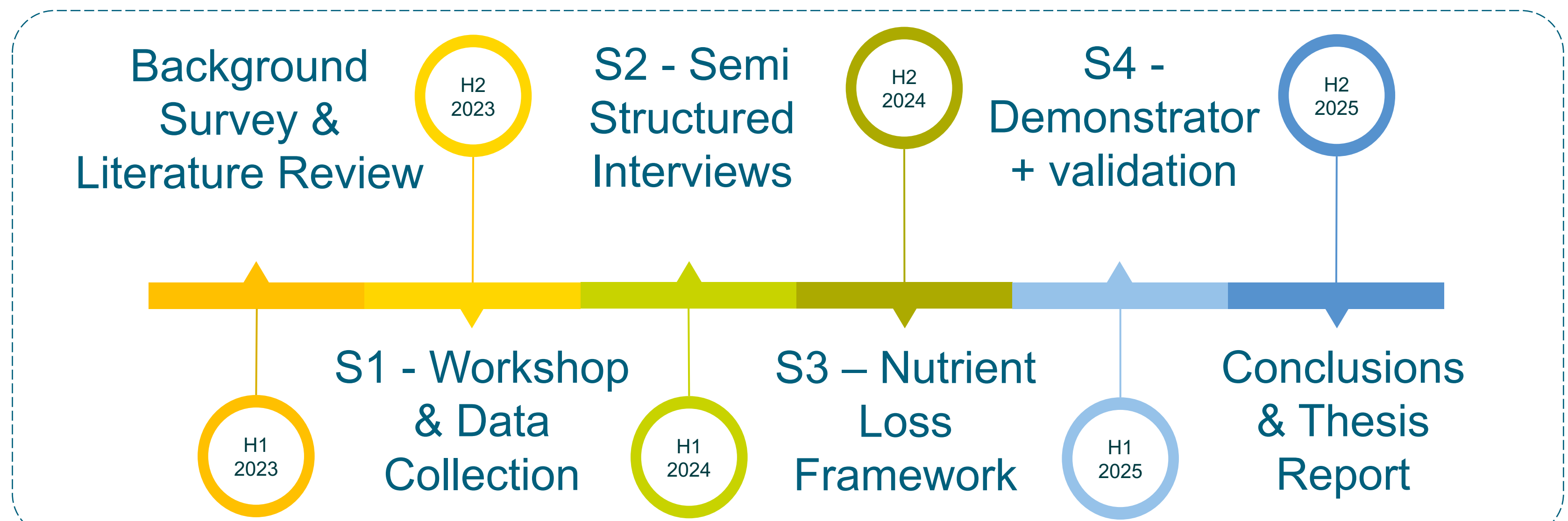
- I. Extend supply chain design and traceability framework from volume to functionality context
- II. Develop and extend the taxonomy for food supply chain design with functionality lens

Practical Contribution



- I. Extends firms competitive advantage via enhanced traceable nutrient delivery
- II. Helps firms deliver additional services founded around functional supply chain delivery

Future Work



- REFERENCES**
- [1] FAO, IFAD, UNICEF, WFP and WHO. 2022. The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO.
 - [2] Malik, V. S. & Hu, F. B. (2022). The role of sugar-sweetened beverages in the global epidemics of obesity and chronic diseases. *Nature Reviews Endocrinology*, 18(4), 205-218.
 - [3] Stevens, G. A., Padozenski, C. J., Flores-Urribe, M. C., Borghi, (2022). National, regional, and global estimates of anaemia by severity in women and children for 2000-19: a pooled analysis of population-representative data. *The Lancet Global Health*, 10(5), e627-e639.
 - [4] Ke, K. B., Diaz, G. M., Veeramani, A., Swanton, C. J., Fraser, D., Skoville, D., ... & Fraser, E. D. (2018). When too much isn't enough: Does current food production meet global nutritional needs? *PLoS one*, 13(10), e0205663.
 - [5] Meyer, A. D., Tsai, A. S., & Hinings, C. R. (1993). Configurational approaches to organizational analysis. *Academy of Management Journal*, 36(6), 1175-1195.
 - [6] Montiel, D., & Dey, G. (2017). History of food traceability. In *Food traceability and authenticity* (pp. 1-30). CRC press.
 - [7] Bont, M. (2016). Legal requirements for food traceability in the European Union. In *Advances in food traceability techniques and technologies* (pp. 225-235). Woodhead Publishing.
 - [8] Muir, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2016). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC medical research methodology*, 16, 1-7.
 - [9] Morse, J. M. (2016). *Mixed method design: Principles and procedures* (Vol. 4). Routledge.



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